North Carolina Energy Outlook 2003

Final Report

Prepared for:

State Energy Office
North Carolina Department of Administration

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EXECUTIVE SUMMARY

North Carolina's economy is projected to grow rapidly over the next twenty years. Today, North Carolinians enjoy a level of prosperity that exceeds much of the rest of the nation. North Carolina's economic performance is one of the reasons why the state is attracting new residents. Another factor that has helped North Carolina attract new industry, new residents, and vacationers is its natural beauty. From its world renowned beaches to the Smoky Mountains, North Carolina offers a harmonious environment.

North Carolina's economic prosperity and natural beauty are attracting new residents.

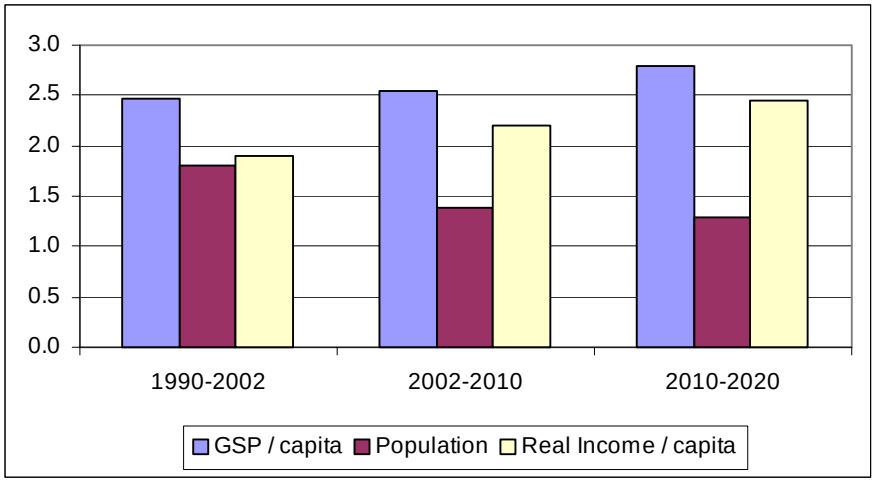
The continued success of the state depends on

(1) increasing the efficient use of energy,

(2) improving the state's air quality,

(3) limiting its expenditures on energy.

The Economic Outlook for North Carolina
(Average Annual Growth Rates)



To ensure the continued success of North Carolina, policymakers and stakeholders have worked together to frame an Energy Plan for the state. North Carolina does not possess any fossil fuel resources, leaving it vulnerable to energy price spikes. The state is also experiencing deteriorating air quality in its major metropolitan areas and the mountainous western region due to vehicle emissions and the burning of fossil fuels by power plants. The State Energy Plan outlines programs and policies that would increase the efficient use of energy, improve the state's air quality, and help reduce its expenditures on energy.

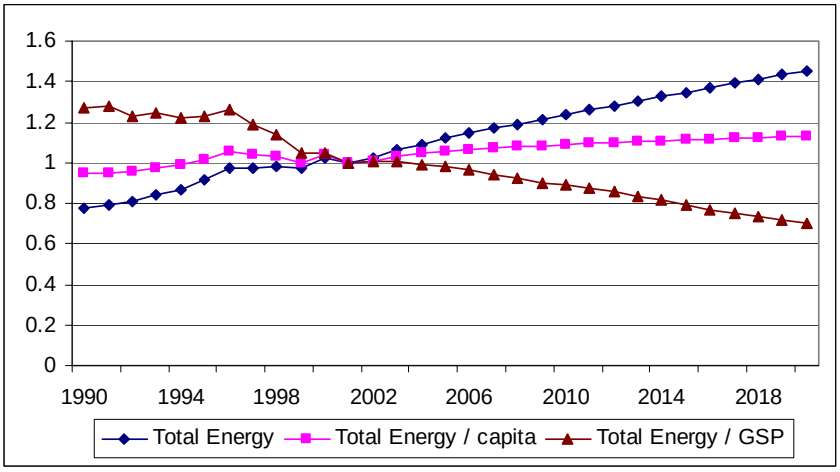
The Outlook for Energy Consumption in North Carolina

North Carolina has had only modest growth in its energy consumption on a per person basis and a real decline in its use per dollar of output (as measured by its Gross State Product or GSP). These trends are now well established and should be repeatable over the next twenty years if program and policies are maintained. However, to increase the state's reliance on renewables and substantially increase its energy efficiency will require new policies, programs, and funding.

Total Energy Consumption *(Indexed, 2000=1.0)*

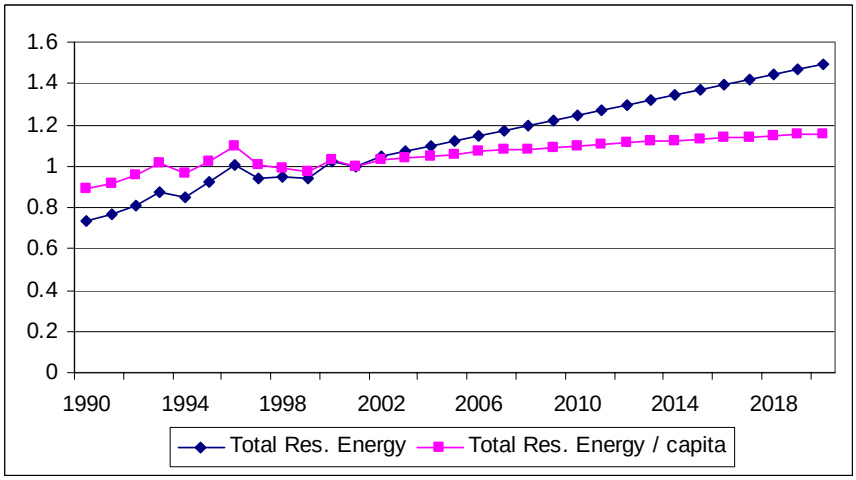
Total energy consumption in North Carolina per capita is projected to grow modestly while real energy prices are rising.

Growing population and expanding economic output (GSP) are the drivers of the projected growth.



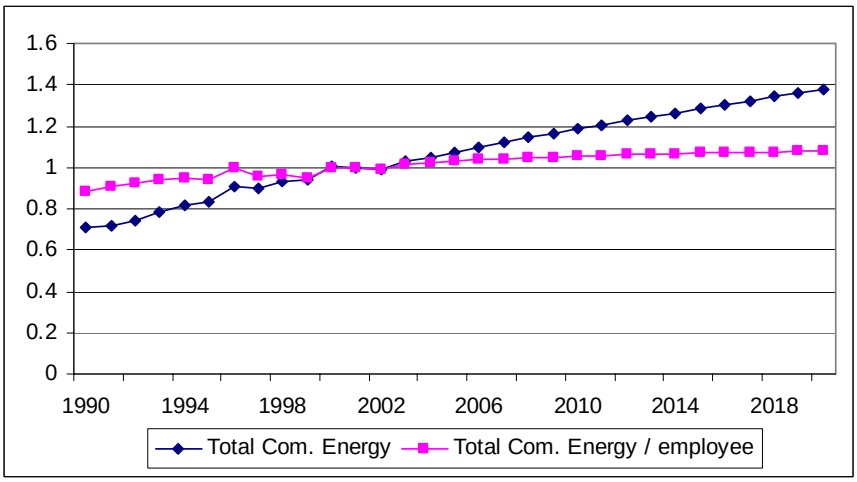
Residential Energy Consumption *(Indexed, 2000=1.0)*

North Carolina residential energy consumption per capita is projected to grow 0.6% per year, slightly slower than the national average of 0.7%.



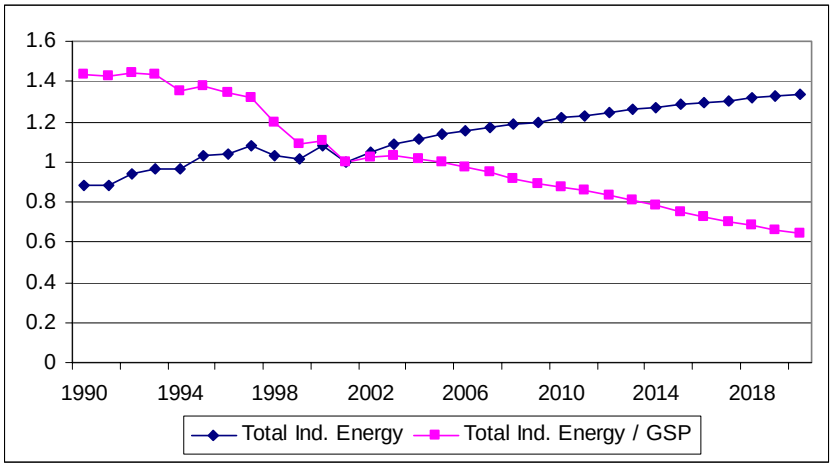
Commercial Energy Consumption *(Indexed, 2000=1.0)*

North Carolina commercial energy consumption per employee is projected to rise very slowly as these establishments have a strong economic incentive to control their energy expenditures.



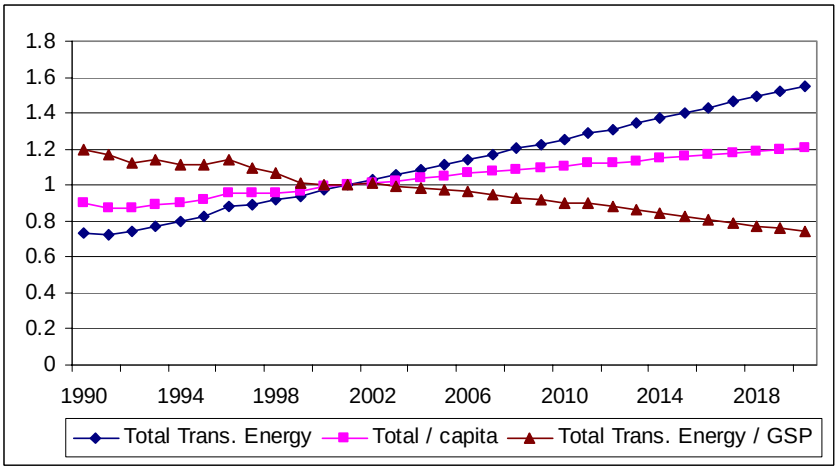
North Carolina industrial energy use per dollar of output will continue to decline sharply, as new investment in less energy-intensive industries continues.

Industrial Energy Consumption *(Indexed, 2000=1.0)*



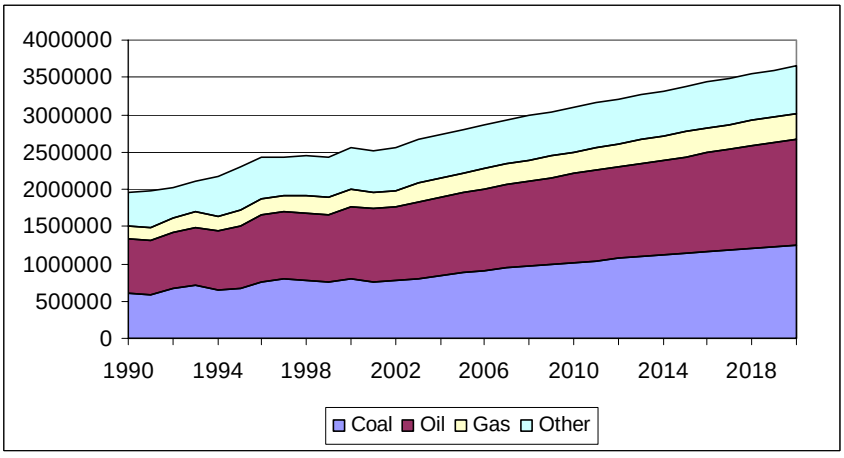
North Carolina transportation energy use is projected to increase reflecting North Carolina's growth in intrastate traffic, interstate traffic, and air traffic.

Transportation Energy Consumption *(Indexed, 2000=1.0)*



North Carolina is increasing its reliance on natural gas and renewables. However, to make more significant strides in renewable energy consumption will require new programs, policies, and funding.

Total Energy Consumption by Fuel *(million Btu per year)*



Recommended Policy Actions

The following are Global Insight's specific recommendations with regard to the State Energy Plan:

Sector	Recommended Actions
Residential/Commercial	• Enforcing more rigid and expanding energy code compliance will be very effective in reducing both residential and commercial sector energy consumption. • Promoting energy audits through tax credits and direct incentive payments will have a significant impact on residential energy consumption. • The state of North Carolina should participate as much as possible in the ENERGY STAR Products, Homes, and Buildings Programs. • *Based upon experience with energy code compliance, energy audit, and Energy Star programs in Massachusetts, energy consumption per person in the residential sector could be reduced from a growth rate of 0.6% per year to 0.3% to 0.5% per year if all recommended measures were fully funded.* • *Based upon experience with aggressive building design and performance contracting for public buildings in Massachusetts, commercial energy consumption could be reduced from a growth rate of 1.6% per year to the 1.1% to 1.3% per year range if all recommended measures were fully funded.*
Commercial/Industrial	• In the commercial and industrial sectors, space cooling and water heating initiatives should be promoted through performance contracting. • Subsidies should be provided to commercial and industrial building owners to conduct energy audits. • The state of North Carolina should develop energy analysis software for commercial and industrial building owners. • Provide incentives such as tax credits or direct payments for the installation of energy efficient measures in new or existing commercial and industrial buildings. • With respect to lighting in commercial and industrial buildings, enforcement and expansion of energy code compliance standards should be aggressively pursued. • With regard to process heat and boiler fuel operation, industrial building owners need to be motivated to install energy efficient equipment. This can be accomplished by offering rebates and direct subsidies. • *Based upon experience with these programs in Massachusetts, industrial energy consumption could be reduced from 0.6% to the 0.2% to the 0.4% per year range if the above-mentioned initiatives are fully funded. This was the experience in Massachusetts in the late 1990s.*
Agriculture	• Direct cash subsidies should be offered for the use of agricultural crops as an energy source for renewable energy to make a meaningful contribution to energy supply. • *Because agriculture is a very important part of the North Carolina economy, it represents a significant source of renewable energy and should be aggressively cultivated as an energy source.*

Public	• Improving public building design standards and initiating performance contracting for public building energy efficiency programs designed to reduce heating and cooling consumption will be very cost-effective energy efficiency expenditures. • North Carolina should require a minimum of 10% of the energy used in the public sector be purchased from renewable sources by 2010. • *Implementation of the above initiatives will allow North Carolina's public sector to play a key role in allowing the state to achieve greater energy independence.*
Power	• By 2010, 10% of electricity consumption in North Carolina should be generated by green power. This should be accomplished by introducing an attractive green pricing policy. • Tax credits and direct subsidies should be offered for the development and implementation of fuel cell projects. • Photovoltaics as a renewable energy source should be promoted with generous tax credits at the state level on the order of 35% should continue to be offered. • To promote the expansion of wind power as a renewable energy source, the restrictions imposed by the Mountain Ridge Protection Act of 1983 should be loosened and tax credits at the state level on the order of 35% should continue to be offered. • Hydroelectric projects should be supported and encouraged through appropriate financial incentives. • North Carolina needs to develop a program or set of programs to replace the DSM programs that have been eliminated by the IOUs. Public benefit funds and renewable portfolio standards are examples of what other states have adopted in the face of declining effort in DSM programs. • A net metering standard with a maximum limit of 1% of total electricity demand should be established. • Power aggregation should be encouraged and facilitated by state programs which keep all electricity customers fully informed as to potential power aggregation opportunities. • *The impact of the above initiatives will be to increase the supply of energy in North Carolina in an environmentally friendly manner, to reduce energy consumption, and to promote reasonable prices.*
Transportation	• Developing financial incentives for highly efficient vehicles and targets for alternative fueled vehicles should be vigorously pursued. Tax credits and direct subsidies should be granted for the purchase of alternative fueled vehicles. • Granting tax credits to businesses that achieve a certain level of telecommuting and offering direct subsidies to commuters who use mass transit are promising policy initiatives that should be implemented. • Increasing the gasoline tax in North Carolina and promoting Smart Growth communities will reduce the number of vehicle miles driven and reduce transportation sector energy consumption. • *Under business as usual conditions, vehicle miles traveled are expected to increase on average by 2.2% per year between 2000 and 2020, vehicle efficiency (miles per gallon) by 2.3% per year, and on-road per-person use by 0.9%. Based upon experience with these initiatives in Massachusetts, it is Global Insight's assessment that if the above initiatives are funded, then the growth in vehicle miles traveled can be reduced by 0.2% to 0.4% per year, vehicle efficiency can be improved by 0.3% to 0.6% per year, and on-road per-person use by 0.1% to 0.3% per year*

Overall	• A public benefits fund should be created in North Carolina through the imposition of a non-bypassable charge on electricity entering the transmission grid. • North Carolina should develop a Renewable Energy Standard for each sector. • A lighting rebate program needs to be an essential part of the Energy Plan. The rebates should be offered for both energy efficient fixtures and bulbs. • Energy topics should be directly incorporated into the school curriculum. This is a very cost effective way of educating the general public concerning energy awareness and providing vocational training on new energy saving technologies and renewable energy sources. • For the State Energy Plan to be truly effective, it must be dynamic. This will require continuous research, which is best achieved by the funding of specific research programs. • Penetration rate studies and consumer surveys should be conducted in North Carolina to evaluate the potential effectiveness of many of its programs. The careful monitoring of the energy savings achieved by each program is essential if the Energy Plan is to be improved over time.

CHAPTER 1: INTRODUCTION

The State Energy Office is North Carolina's lead agency for energy programs and serves as the official source for energy information and technical assistance for consumers, businesses, government agencies, and policy makers. It is responsible for administering the State Energy Program of the U.S. Department of Energy.

The State Energy Office administers programs in four primary areas:

- Energy efficiency and renewable energy for the residential, commercial, industrial, agricultural, transportation, and power generator sectors.
- Alternative fuels and alternative fuel vehicles.
- Energy policy recommendations to the North Carolina Energy Policy Council, North Carolina General Assembly, the Governor's Office, and other state agencies.
- Energy emergencies during natural disasters and supply disruptions.

Since the state does not possess any fossil fuel resources, it is vulnerable to potential supply disruptions and energy price spikes. In addition, the state is experiencing deteriorating air quality in its major metropolitan areas and the mountainous western region largely due to vehicle emissions and the burning of fossil fuels by power plants.

To address these issues, the State Energy Office has focused upon the development of indigenous renewable energy resources (biomass, hydro, wind, landfill gas, and solar) and energy efficiency programs. At the present time, the state obtains about 3% of its energy requirements from renewable resources, with the potential to get a much larger share if these resources are aggressively developed.

Specifically, the State Energy Office proposes the following initiatives:

- Actions to ensure that up-to-date and well-tested energy response plans are in place in the event of supply disruptions or curtailment.
- Strong support for the development of alternative fueled vehicles to reduce vehicle emissions and reduce reliance on overseas petroleum.
- Integration of environmental concerns with energy supply development to ensure the improvement of air and water quality.
- Increased federal funding for low income households to weatherize their homes.
- Increased funding of energy efficiency programs, including both implementation programs and research and development efforts.
- Increased funding of renewable energy programs.

This report provides a comprehensive assessment for the state of North Carolina of the opportunities and constraints for all types and uses of energy by economic sector. It provides a detailed outlook for energy, assuming a continuation of current trends, and an assessment of the potential opportunity to improve North Carolina's energy outlook.

Specifically, the report addresses the following topics:

- The economic and demographic outlook for North Carolina.
- The outlook for energy availability and its impact on North Carolina energy prices.
- The outlook for North Carolina energy consumption and expenditures.
- A comparison of North Carolina's energy prices, consumption, and expenditures to the South Atlantic and the U.S.
- The potential for alternative energy resources, conservation, and policies to increase energy efficiency, improve air quality, and reduce North Carolinians expenditures on energy.

CHAPTER 2: ECONOMIC OUTLOOK FOR NORTH CAROLINA

Overview

The U.S. economic recovery is plodding along and will gather steam slowly over 2003, after growing 2.3% in 2002 – little better than half the rates achieved in the late 1990s. Although war jitters may be having some dampening effect, the real economy is in better shape than the behavior of financial markets indicates. Further recovery is expected to bring real GDP growth to around 3% for 2003 as a whole; for the full period to 2020, it is expected to average 3.2%.

North Carolina's economy was unable to find a positive direction in 2002. Total non-farm employment contracted 0.2% with non-manufacturing increasing 0.7% and manufacturing declining 4.1%. The state's textile, apparel, and furniture manufacturing firms continued to reel due to tough trading conditions and fierce foreign competition. In addition, layoffs in the banking sector, sparked by mergers and rising loan write-offs, have left payrolls in the finance, insurance, and real estate (FIRE) sector flat through the middle of the year. The transportation, communication, and utilities (TCPU) and construction sectors also posted employment declines. Weak economic conditions saw the state's unemployment rate ratchet up to 6.4%, compared with a rate that was below 6.0% in 2001.

North Carolina's economy is projected to slowly recover over 2003. Total non-farm employment, which contracted in 2002, should grow by 1.4% in 2003 as the national recovery firmly sets in and business and consumer spending quickens. The beleaguered manufacturing sector is the primary reason for the state economy's current malaise, and ongoing weakness in national and global markets, combined with strong foreign competition, means that the sector will continue to shed jobs. Consequently, manufacturing employment is expected to decline a further 1.2% in 2003. In addition, employment in the FIRE sector, which fell 0.2% in 2002 as banks and financial institutions continue to shed jobs in a bid to trim costs following a series of recent mergers and a growing number of bad loans, should improve. North Carolina's strong position as a regional financial cluster will be the impetus behind renewed growth, with payrolls growing by 3.0% in 2003.

During the next couple of years, non-manufacturing will continue to be the main engine of employment growth. Employment in this sector increased in 2002 and, as economic activity picks up in 2003, payroll growth will ratchet up to levels more reminiscent of the late 1990s, at around 3.5%.

Over the next five years, North Carolina's economy will post moderate but steady growth. Total non-farm employment is expected to increase by 1.3% annually, with continued job losses in the manufacturing sector being counterbalanced by

brisk employment growth in the services and FIRE sectors. After peaking at slightly more than 6.5%, the state's unemployment rate will drift back down to around 5.3% by 2007.

Contributing to the expectations for economic growth is a new state business incentive program that was passed by the General Assembly in 2001. The controversial legislation gives selected companies rebates on the NC tax withholdings for their employees. Modeled after similar programs offered in South Carolina and other states, the program establishes a committee of five state officials with the power to authorize rebates of as much as 75% of the state withholdings on jobs created by new or expanding companies. The incentives would be limited to 15 companies per year, with the state making inducement payments to each business for up to 12 years. The total cost of the program is capped at $240 million over the next 13 years.

Although the legislation has been criticized as corporate welfare by a range of lobbying groups, Charlotte business leaders believe it will bring job growth to their metro area. Indeed, Charlotte Chamber of Commerce officials say the state has, for too long, seen potential new businesses walk away when other states offered lucrative tax breaks, free land, or other enticements. They expect that the new incentives will give Charlotte and other North Carolina cities a tangible way of sending the message that the state wants new business.

Outlook for Key North Carolina Industries

Finance and Insurance

Over the past decade, North Carolina has emerged as one of the nation's banking powers. Thanks to a steady stream of mergers and acquisitions, the state now boasts two of the four largest banks in the country—Bank of America and Wachovia Corporation, which are both headquartered in Charlotte. The merger of First Union Corp. and Wachovia was official on September 1, 2001, and created the fourth largest financial institution in the country, with 19 million customers and $324 billion in assets. Along with this type of merger come the inevitable branch closings and job reductions. Wachovia Securities announced in December 2001 that it would cut 400 jobs in Charlotte, as it combined the brokerage arms of the newly formed corporation. In January 2002, it was announced that nearly 160 jobs were being cut as Wachovia's wealth management business moved its technical operations to Charlotte from Winston-Salem. When the application to merge the bank charters was filed with federal regulators, Wachovia stated that it would be closing 65 branches, 11 in North Carolina, in the second quarter of 2003.

The recent downturn in the national economy has left some North Carolina banks with credit quality issues needing to be addressed. In a state that is highly dependent on manufacturing, a sector that has suffered significantly in the recent recession, the economy will be more vulnerable even as the national recovery

begins. Bank of America and other major North Carolina banks are reducing their exposure in the textile and apparel industry, limiting it to only the strongest performers in the industry. One factor that bodes well for North Carolina's big three banks, Bank of America, Wachovia, and BB&T Corp., is that they are in a number of markets, and this geographic diversity makes the ability to weather a downturn much better.

High Tech

The growing economic problems facing the nation's telecommunications industry are having a direct impact on North Carolina's high-tech industry. The issue is particularly acute because almost 60% of the nation's fiber-optic cables are made in the Charlotte region, and the over-capacity built up in the late 1990s is resulting in much lower demand for telecommunications-derived products.

Most recently, Globespan Virata, a California-based semiconductor manufacturer, closed its operations in Raleigh, citing the struggling telecommunications industry. North Carolina has also seen telecommunication firms, such as Hatteras Networks and Redback Networks, reduce their presence in the state due to the same reason. In addition, Celestica and Solectron, manufacturing spin-offs of Cisco Systems, made significant job cuts at the end of last year, with Solectron closing down its operation all together. Furthermore, one of the cornerstones of the state's high-tech industry, Cisco Systems, has put plans to expand into six new buildings on hold. Nortel Networks, which employs 4,500 in the Raleigh area (about 10% of the company's total workforce), announced another round of job cuts for the end of 2002. In a sign of the problems facing the industry, office vacancy rates in Research Triangle Park increased to 15.6% in the first quarter of 2002, up from a rate of 5.4% in the same period a year earlier.

On the positive side, the state's biotech sector is showing signs of growth. Diosynth, a Netherlands-based pharmaceutical company, is planning to increase its presence in North Carolina. Already employing 600 workers at its Research Triangle Park location, Diosynth has agreed to build a new 300,000-square-foot manufacturing facility that will eventually lead to the addition of numerous new jobs.

With major firms, such as Cisco Systems, in the Research Triangle Park, North Carolina will maintain its position as a center of high-tech commerce in the years to come. This position was recently highlighted when Hatteras Networks closed on $45 million in new venture capital funding for its research on speeding up telecommunications networks. Nevertheless, the recent news from Nortel Networks, which has already cut 50,000 jobs in the past two years yet continues to struggle, points to the fact that the next few years will not see a return to the rapid employment growth that happened at the end of the last decade.

Manufacturing

After a brief respite in the mid-1990s, when North Carolina's manufacturing firms enjoyed a few years of growth following the 1990–1991 recession, the state's manufacturing sector has again resumed its downward trend. In 1995, around 864,000 workers were employed in the manufacturing sector, representing 25% of the state's total non-farm employment. In the next few years, manufacturing employment declined by an average of almost 2% per year, as growing foreign competition and a strong dollar led to an increasing pace of job losses. As global economic conditions worsened, manufacturing employment has plummeted, and today it represents less than 20% of total employment.

To a large extent, the sharp decline in manufacturing during this period has been due to a unique combination of factors in the structural make-up of the sector. North Carolina's manufacturing sector has a heavy reliance on the textiles industry—which accounts for 17% of total manufacturing employment—along with apparel, furniture, and tobacco industries. These industries, which require access to relatively low cost, unskilled, labor, are particularly exposed to competition from firms in locations around the globe that have a large supply of cheap labor and do not face the same type of environmental and workers rights laws as in the United States. In the mid-1990s, the importance of low-cost labor to these industries was brought home with the advent of NAFTA.

The signing of the NAFTA trade agreement opened the door for direct competition from Mexico, where labor costs, both direct and indirect, are considerably lower than in North Carolina. This had a direct effect on the state's manufacturing sector, particularly the textile and apparel industries, with manufacturers quickly drifting south of the border on account of these cost advantages. The change in employment in the five years following 1995 dramatically emphasizes this, with employment in the textile industry falling at an annual rate of 6% and employment in the apparel industry collapsing by more than 10% per year. The growing problems in the state's textile sector have led to three of the largest textile firms in Greensboro—Guilford Mills, Burlington Industries, and Galey & Lord—petitioning for chapter 11 bankruptcy protection. While all three firms are expected to be able to reorganize successfully, they will emerge much smaller and with increased emphasis on automation, which will mean even lower demand for labor.

The state's timber and furniture companies have also felt the affects of growing global competition. In particular, increasing competition from China is forcing many Tar Heel furniture makers out of business, which is having an affect on the state's timber industry. North Carolina's furniture makers are now facing competition from Chinese manufacturers, who as recently as five years ago were unable to match the quality of U.S.-made furniture. But the Chinese manufacturers have bought and mastered the use of Italian and German lathing machines and are producing top-quality furniture. On top of this, manufacturers

in China have the added competitive advantage of much lower labor costs. Furthermore, the recent advent of China entering the World Trade Organization means that the competition for the North Carolina's furniture makers will not soon abate. As a result, the state's timber industry will have to look farther afield for new opportunities.

During the past decade, the tobacco industry has also been dealing with a number of issues that have impacted its growth prospects. Indeed, the restrictions on advertising, the anti-smoking campaigns by health authorities, and the compensation paid by the industry to state governments have put a heavy burden on the industry. The increasing cost pressure placed on tobacco companies has resulted in employment in this sector falling by an average of 3.9% annually from 1995 through 2001.

The downturn in North Carolina's manufacturing base has been hardest on rural areas. In many places, the local economy is still highly dependent on a single large employer, and thus highly vulnerable when business conditions turn sour. This was recently demonstrated in Holly Ridge (Onslow County), which lost 500 jobs when Tyson Foods shut down its bacon production facility in June in an effort to reduce costs. The plant, which had been in operation for more than 30 years, employed more than 50% of the town's population.

The outlook for the manufacturing sector remains grim. To meet ever increasing competition from abroad, North Carolina's manufacturers will look to niche markets and increased automation as the only way to stay competitive. Both of these avenues will lead to a further reduction in the amount of labor required, resulting in more job cuts. The fact that Asia is now becoming the dominant center for textile and apparel manufacturing is emphasized by the recent news that Burlington Industries is reducing its workforce by 4,000, with job cuts coming not only in the United States but also in Mexico. With global trading conditions remaining weak, and pressure mounting for manufacturers to move to cheaper production locations outside of the United States, it is expected that manufacturing employment in the Tar Heel State will contract by around 1.3% annually through 2007, falling to around 16.0% of total employment.

CHAPTER 3: THE OUTLOOK FOR NORTH CAROLINA'S FUEL AND ELECTRICITY PRICES

Overview

Despite a weak economy, oil and natural gas prices rebounded in 2002, bolstered by a combination of temporary and fundamental factors. In 2003,

- Market fundamentals will replace fear as a driver of oil prices. Abundant supply will overmatch demand, and prices will slip slowly as the year progresses. WTI is expected to average $26/barrel in the second half of 2003.
- Natural gas storage fell to record lows by the end of the 2002-2003 heating season, a result of weak performance on the supply side and a cold winter in the major gas-heating regions. Storage injection will have to compete for available gas supplies with the rising number of gas-fired electricity generating units throughout the United States, permitting only slow adjustment in gas prices from the dramatic mid-winter highs. As new supplies come on line by the second half of the year, prices should abate somewhat, though remain strong by historical levels. Demand is likely to remain weak in gas-intensive industries.
- Spot market coal prices, which nearly doubled trough-to-peak in 2001, have now lost much of those gains. Coal inventories appear to be heading toward normal levels in the wake of a hot air-conditioning season and a cold heating season. Nevertheless, coal purchasing remains constrained by a sluggish economy and heightened competition from hydro and natural gas.

Following modest fluctuations and corrections during the next few years, oil and gas prices are expected to follow a slow real (inflation-adjusted) incline to 2020, reaching levels that are roughly similar to recent prices and below previous peaks. Rising demand will increase the call on oil and gas reserves and gradually deplete the least costly supplies, but with steady, relatively solid prices, the necessary supply development should take place. The risk of price volatility is ever-present, however, in the event of unexpected demand fluctuations accompanied by less-than-timely responses on the supply side. Coal prices are likely to decline in real terms, as continued productivity improvements help coal suppliers compete with natural gas in the crucial power generation market.

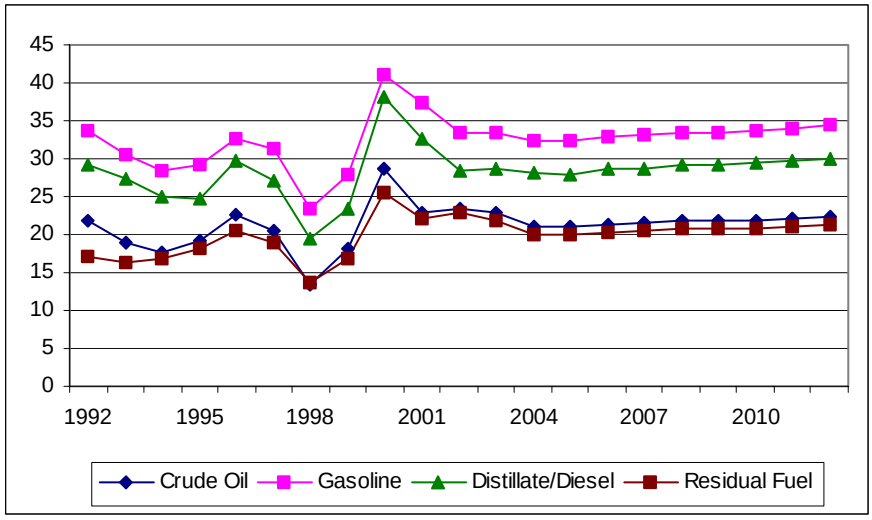
Short-term fluctuations aside, annual average electricity prices to end users are expected to reflect underlying costs in the power sector, with the most prominent impact of regulatory restructuring likely to be increased, competition-driven pressure to contain costs. Improving efficiencies in the power sector and declining real coal prices should produce flat to declining real end-use electricity prices. Clearly, further changes in electricity market legislation and regulation at the state or federal level could have significant impact on future electricity prices.

At this point, however, the drive to deregulate has been stalled by the California experience and by revelations of market manipulation by electricity suppliers in "open" market states.

Outlook for Crude Oil

In 2002, oil market fundamentals played only a minor role in setting crude oil prices. The price was set largely by political events that led to increased price volatility. It could be said that prices were driven to a great extent by fear rather than fundamentals; the same was true for the first half of 2003, but fundamentals should replace fear for the second half of the year.

Crude Oil and U.S. Wholesale Petroleum Product Prices
(2001 Dollars per Barrel)



Oil markets entered 2003 without 2.5 million barrels per day (b/d) of Venezuelan exports. The loss was brought about by a country-wide strike that ground operations at Petroleos de Venezuela (PDVSA) nearly to a halt. The United States, which takes more than half of Venezuela's exports (they account for about 15% of all U.S. oil imports), has been hit hard by the loss of exports, particularly since U.S. oil inventories were already low. The strike lasted through February, but resolution of the strike has not meant an instant return to full production (about 3 million b/d) for PDVSA. By April, production reached approximately 2.6 million b/d, and it is believed that it will take until 2004 for production to return to pre-strike levels. Thus, despite a surge in production from the rest of OPEC in the first quarter of 2003, markets are lean enough to keep prices at relatively high levels for much of the year.

Another factor that will keep markets lean is that Iraqi production has been halted because of the war between Iraq and coalition forces. Iraq was exporting 2.0-2.5 million b/d of oil prior to the war, but a resumption of exports is not likely until July at the earliest, and even then at small volumes. Iraqi exports are not expected

to surpass 2 million b/d this year, given the damage done to oil facilities (by looting, not war) and the neglect of those same facilities over the past 12 years.

In the aftermath of war, OPEC has been concerned about oversupply as Venezuelan and possibly Iraqi production ramps up, while the rest of the cartel is potentially producing at close to capacity. Global demand growth is slated to increase by less than 1 million b/d in 2003, growth that will be met by the expected increases in non-OPEC production. Therefore, OPEC will need to rein in production or risk a severe price drop. Given OPEC's penchant for prices in the mid to upper $20s, we believe that the cartel will curtail its output to keep prices supported. The high price environment seen over the past several years, however, has encouraged non-OPEC production expansion to the point that the increases in non-OPEC production should meet most, if not all, of the expected increases in global demand in 2003 and 2004, thus exerting relentless downward price pressure that should result in lower prices in 2004.

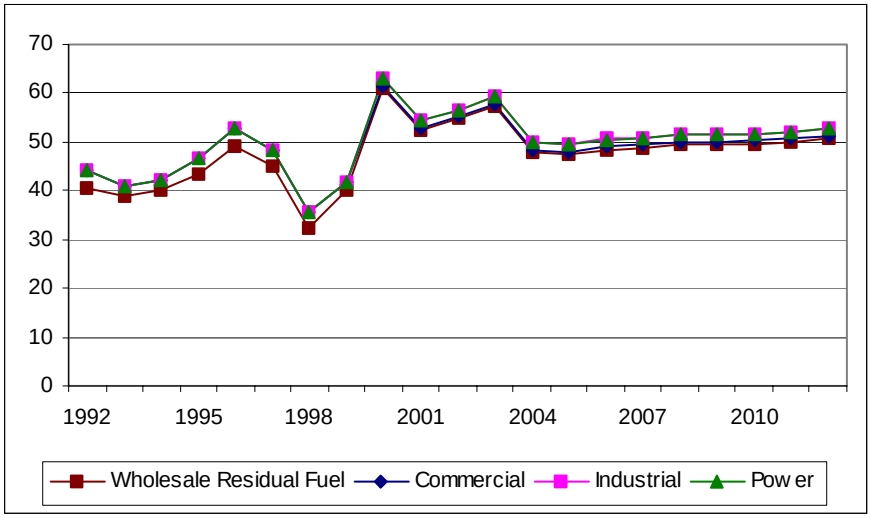
In the long-term, real crude prices are expected to rise gradually, increasing less than 1% per year. The long-term forecast is dependent on steadily increasing global demand as a result of economic expansion, coupled with coordinated action from OPEC that keeps oil markets adequately, but not over, supplied.

Prices for the refiners' acquisition cost of foreign crude oil are not seen falling back to 1998 levels over the forecast interval. Nevertheless, they are expected to fall to levels lower than what has been seen in recent years, hovering around $21-23/barrel in real terms through 2012. Price growth accelerates slightly thereafter, and by 2020, crude prices are expected to reach around $25/barrel, measured in constant 2001 dollars, the equivalent of around $40/barrel in nominal terms.

North Carolina's Petroleum Product Prices

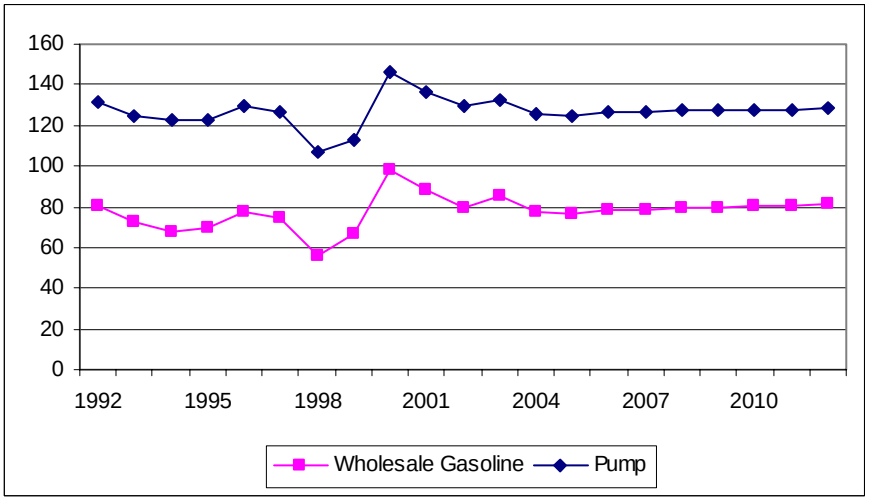
North Carolina's petroleum product prices reflect the international price of crude oil and the traded price of petroleum products in the Atlantic market. In 2002, North Carolina's price for home heating oil (distillate fuel) was $1.23 per gallon, while the residential price of propane was $1.93 per gallon. Both prices are projected to track crude oil prices through 2020. Industrial distillate and residual fuel prices have been very high lately reflecting the vagaries of the crude oil market.

U.S. Wholesale Residual Fuel Price and North Carolina's Delivered Price of Residual Fuel by Sector *(2001 Cents per Gallon)*



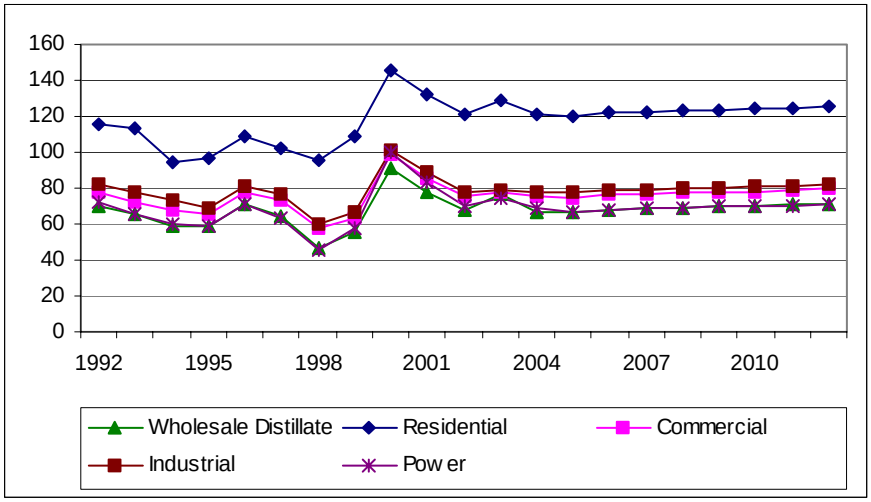
Retail motor gasoline will end the forecast essentially flat in real terms. In 2002, both wholesale and retail gasoline prices rose again, and are projected to decline when crude oil prices weaken. Real declines in federal, state, and local taxes will result in retail motor gasoline prices remaining essentially flat through the latter half of the forecast.

U.S. Wholesale Gasoline Price and North Carolina's Pump Price of Gasoline *(2001 Cents per Gallon)*



Distillate fuel prices in the electric power sector will rise faster than either natural gas or coal. Electric power sector distillate prices hovered near $5.11 per mmBtu in 2002. Longer term, distillate fuel oil prices will track the change in crude oil prices, reaching $6.06 per mmBtu in 2010.

U.S. Wholesale Distillate Price and North Carolina's Delivered Price of Distillate Fuel by Sector *(2001 Cents per Gallon)*



Natural Gas

Natural gas prices rose sharply in late 2002 as weather-driven demand sky-rocketed, and are projected to remain high through 2003 driven by economic recovery and declines in productive capacity. The gas rig count dropped sharply in 2002 because of low prices and has not recovered even though prices exceeded $5/mmBtu during the winter. Consequently, natural gas productive capacity is likely to decline during 2003, while natural gas consumption will increase as the U.S. economy recovers.

A key issue is the cost of developing and producing incremental gas supplies. At present, 85% of U.S. gas is from the Lower 48 states—down from 97% in 1986. Increasing production in the Lower 48 should be the most immediate source of new supply, but until recently, these production levels have been stagnant. Even after the gas rig count increased 46% in 2000 and 37% 2001, natural gas production increased only some 2% per year. Thus the outlook for supply growth is muted, and demand growth, also expected to be around 2% per year, will have to be met with increased imports or unconventional sources such as the deep water, coalbed methane, liquefied natural gas (LNG), deep drilling, Mackenzie Delta, and Alaska. There is substantial uncertainty about what these supplies will cost. The supply cost for the largest incremental supplies of natural gas available to the United States is expected to exceed $3 per million Btu.

Economic expansion, albeit slow, will increase requirements for natural gas in 2003 and beyond. Will supplies be available? At what price? Despite recent high prices, expenditures on exploration and production (E&P) are not rising. U.S. expenditures are expected to decrease by 0.7%, while estimates of finding costs are up. Further, producers state that a lack of qualified prospects has diminished enthusiasm for investment. Thus, the prospects for U.S. supply growth are poor.

Supplies from Canada are also under pressure. The National Energy Board expects gas production from the Western Canadian Sedimentary Basin (WCSB) to fall about 600 million cubic feet per day (mmcfd) over the next two years, even with substantial increases in drilling.

While the country's traditional natural gas supplies may not increase in 2003, there are some positive supply developments, including the reopening of the Cove Point LNG facility, the start-up of the Kern River pipeline expansion, and the Okeanos offshore pipeline. Coalbed methane production in Wyoming will increase by several hundred mmcfd, exceeding 1 bcf/day in 2003. The Barnett shale area is also expected to be a source of significant production increases. These expansions will start having an impact by mid-2003, thus pushing the highest risk of price spikes into the first half of the year, prior to the major supply additions.

While the outlook is not sanguine, supply and demand have some room to adjust, such that any crisis should be short-lived. During past price surges, inter-fuel substitution, greater use of natural gas liquids, and closure of gas-intensive industry accounted for several bcf/day of net change. With LNG imports at 0.5 bcf/day in 2002 and LNG import capacity rising to nearly 2.7 bcf/day in 2003, a large increase in LNG imports is also possible. Further, there are several bcf/day of available pipeline capacity from Canada that could be filled by increased drilling in Alberta, British Columbia, and Saskatchewan. Thus, supply and demand will respond to price signals, and price spikes are likely to be transitory rather than permanent in the short-term.

Longer term, U.S. natural gas prices will reflect the cost of new supply sources as demand increases steadily. Increased imports are the principal option for increased gas supply in 2003–2010, while Alaskan gas will not become available until after 2010 because of the lead time required to reach consensus on development and to build a pipeline. Expanded development of coalbed methane and offshore Gulf of Mexico are also being pursued. With western Canadian supply facing similar issues as the United States, net increases in supply will most likely be from LNG or ultimately the Arctic.

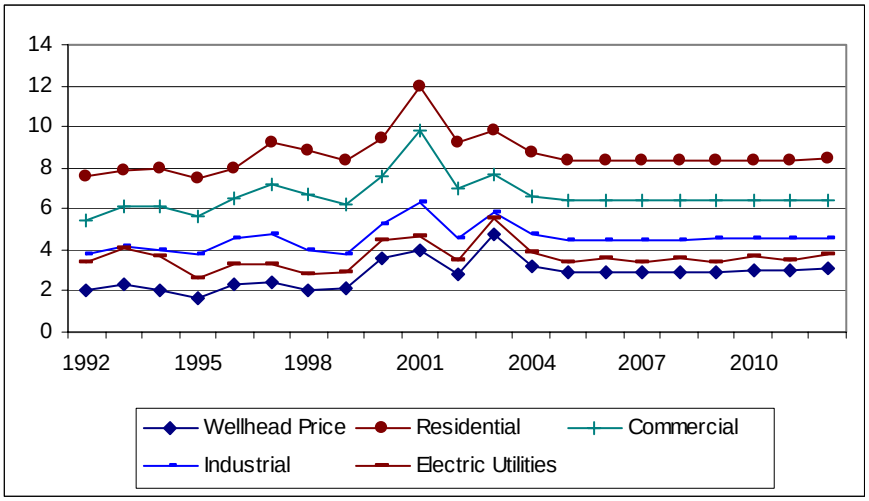
The outlook for LNG trade growth is positive for 2004 and beyond as world supplies of LNG increase rapidly. LNG will grow in importance and help to set the long-run price of gas in the United States. New LNG projects can be developed at $2.85-4.00 per million Btu delivered to pipelines in the U.S. The lower end of the price band reflects additions to the Atlantic LNG project in Trinidad and use of existing terminals, while the higher estimates reflect the costs for developing LNG at new sites more remote from the United States. Pre-existing receiving and regasification facilities would handle initial growth in U.S. LNG imports, which lowers the price required to make LNG economic.

Alaskan gas could be shipped to major U.S. markets via pipeline beginning in 2010. The principal destination of the gas would be Chicago, entailing a pipeline from the North Slope to Alberta and then expansion of existing Alberta to Chicago capacity. Estimated project costs for transporting natural gas from Alaska to Alberta range from $8 billion to $17 billion. The most recent estimates, released by the Mackenzie Delta Producers Group, were $15 billion for the northern route to $17 billion for the southern route. Thus, Alaskan gas will not be developed until Henry Hub prices exceed $3.00/mmBtu (2001 dollars) for an extended period.

North Carolina's Natural Gas Prices

North Carolina's delivered cost of gas is comprised of the commodity cost of gas plus the cost of transmission and distribution. While the commodity cost of gas is market-based, transmission and distribution costs remain largely subject to regulatory oversight. Over the long term, unbundling of the merchant function from transmission and distribution costs are creating competitive forces to reduce costs. In addition, the rapid growth in natural gas use for electric generation is raising the utilization rate of transmission and distribution facilities. Thus, the non-commodity components of retail prices are likely to decrease in real terms.

U.S. Average Wellhead Price of Natural Gas and North Carolina's Delivered Price of Natural Gas by Sector *(2001 Dollars per Million Btu)*



The residential price of natural gas in North Carolina is expected to increase gradually. In 2002, the price of natural gas in the residential sector was $9.36/mmBtu and the commercial natural gas prices was $7.15/mmBtu. In 2003, delivered prices will remain high as the commodity cost of gas (the price of gas at the wellhead) will be expensive. Through 2020, both residential and commercial natural gas price will fall 0.5% annually in real terms.

In the industrial sector, the price of natural gas in 2002 reached $4.70/mmBtu. Prices will stay high in 2003, but should weaken in 2004. After 2005, gas prices will rise at an annual rate of 0.3% in real terms.

In the electric power sector, the price of natural gas reached $4.66/mmBtu in 2002, and are projected to average $5.22/mmBtu in 2003. In 2020, the price is projected to rise slowly reaching $7.62/mmBtu in real 2001 dollars.

Coal

Following several years of turmoil, coal markets at the end of 2002 are reaching a critical juncture. There are strong competing forces at play, some of which are pressuring coal prices to be higher, while others tend to suppress those same prices. Not surprisingly, many buyers and producers have opposing views as to where prices are heading, leading to a decided difference in perspective that becomes evident as these two groups try to reach agreement at the contracting table. Global Insight's perspective is that while coal prices must be higher than what was experienced in the very low period of 1999-2000, they must nonetheless be highly competitive given the strong environmental and inter-fuel pressures that will emerge in the next few years.

A brief review of the turmoil experienced recently in coal markets begins with the very soft, declining market conditions that pervaded 1999 and most of 2000. The first six months of 2000 were particularly weak, as the warm winter of 1999-2000 left power companies with high stockpiles and very little interest in spot market purchases. This lack of purchasing activity, coupled with a generally dismal outlook for coal in the long run, led many suppliers to exit the market or sell their holdings to other companies, leading to a highly consolidated coal producing industry.

The winter of 2000-2001 was both early and severe, catching a large portion of the power industry short on coal inventory. When power companies attempted to bring in large volumes of coal in order to meet strong electricity demand, as well as shore up their dwindling stockpiles, the coal industry responded with higher prices instead of their customary return to higher production. Part of this response was due to the inability of some of the coal industry to actually produce sufficient quantities of coal given the massive closure of mining capacity (e.g., in much of the East). At the same time, part of the response was a deliberate effort by the more consolidated industry to demonstrate its market power by keeping idled capacity shut, thereby pressuring prices up.

Prices spiked in most coal mining regions in early 2001 at nearly twice the previous year's mine-mouth price. Between then and now, however, prices have fallen (although not to the very low levels in 2000). The major reasons behind the market price decline have been moderate weather, a lackluster economy resulting in reduced coal-fired generation, the strong return of hydropower from its very low generation in 2001, the emergence of natural gas as a major competitor for electricity generation, and the determination of power company coal buyers to replenish their inventories as a protective measure against potential shortages in the future.

Coal prices in the near future (three years out) are likely to be characterized by the following trends:

Higher Prices. While not reaching anywhere near as high as the prices seen during the 2001 market surge, prices will be at a level well above those experienced in the previous decade and before. This situation is due largely to the greater concentration in the coal industry, which leaves suppliers less likely to commence higher production in the absence of long-term market commitments. At the same time, the higher prices reflect a growing awareness on the part of buyers that the prices of the pre-2001 period were simply too low to sustain a healthy, competitive coal industry.

A More Volatile Spot Market. The spot market for coal has historically maintained a lower price than found in the contract market, stemming from the fact that coal was generally widely available, with too much production chasing too little demand. As coal industry consolidation has occurred, excess mining capacity has been greatly reduced. As a consequence, unexpected surges in coal demand—whether from increased economic activity or possibly lower electricity generation from competing sources (such as hydro or natural gas)—could result in substantial price spikes as the coal industry responds more deliberately. To a great extent, price volatility will be more evident on the "high price" side, as coal companies seek to create a floor to price declines by simply shutting in capacity.

Greater Reliance on the Contract Market. Contracting for coal may well come full circle. Throughout much of the 1980s and 1990s, most power companies were saddled with high-priced, long-term coal contracts while prices in the short-term market continued to fall. As these contracts expired, many buyers shifted more of their purchases to the short-term market. This turned out to be a very effective strategy all the way up until late 2000, when prices spiked and power companies were saddled with extremely high prices. As a result of this greater volatility in the spot market described above and the greater concern over coal availability given the industry's consolidation, many power companies are making efforts to negotiate longer-term supply arrangements. At the same time, these companies are inserting periodic price reopeners into these contracts to ensure some consistency with general market trends.

Three major trends are likely to drive the coal market in the long term:

Increased Inter-Fuel Competition and Environmental Requirements Will Lead Coal Producers to Price Attractively. Over time, coal will experience considerable competition from an influx of highly efficient natural gas generation. Moreover, the pressure will build for power companies burning coal to install costly pollution control equipment to deal with such problems as SO_2, NOx, regional haze, PM2.5, and mercury, among others. SO_2 is the main cause of fine particles, haze, and acid rain, while NOx is the main cause of ozone and contributes to acid rain and haze. This fuel competition and additional generating cost will leave relatively little room for coal to increase prices substantially and still remain competitive.

Productivity Gains Will Allow Coal Companies to Keep Prices Low While Simultaneously Improving Their Profit Situation. The modestly higher prices we expect to see in the short term will serve as a base for coal companies to reinvest in productivity-enhancing equipment after several years of neglect. This investment will, in turn, lower production costs, allowing coal companies to price their product competitively without sacrificing profit margin. Some coal regions with favorable geological conditions (e.g., the Powder River Basin) will succeed in achieving major productivity gains, while a select few other areas experiencing more difficult mining conditions (e.g., Central Appalachia) will struggle simply to hold onto the productivity levels they have currently achieved.

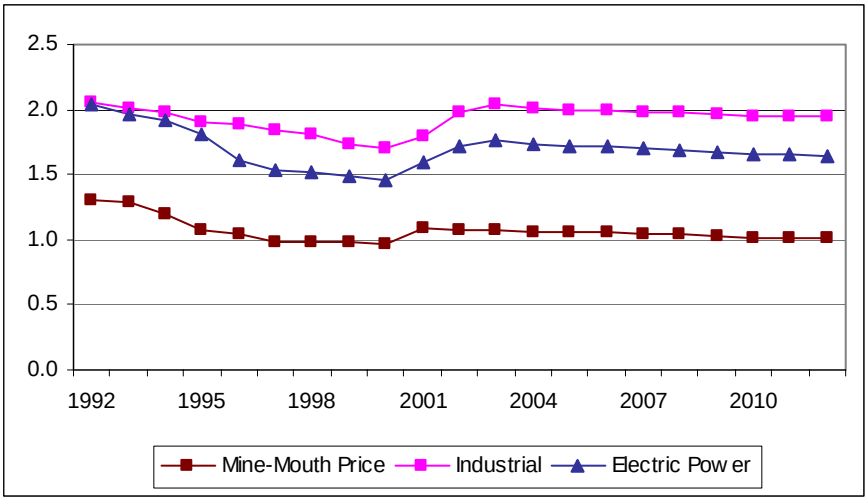
Higher-Sulfur Coals Will Substantially Increase Their Output Due to Environmental Pressures and Lower Delivered Coal Prices to Power Companies. Current regulations favor the use of low-sulfur coals as a least cost compliance strategy, but toward the end of this decade, an increasingly large number of coal-fired units will be forced to scrub (i.e., install flue gas desulfurization equipment). After having made such an investment in this pollution control equipment, the incentive for coal buyers will change from seeking a low-sulfur coal to seeking the most inexpensive coal, regardless of sulfur content (since the scrubber will remove almost all the SO_2 before it can exit the stack). As a result, high-sulfur coalfields such as the Illinois Basin and Northern Appalachia will flourish as many power plants in proximity to these regions switch. At the same time, we do not anticipate that low-to-mid sulfur coal markets will suffer greatly, as scrubber technologies emerge that reduce the scrubber costs for these coals (relative to high-sulfur coals) and make them competitive in many instances with the higher-sulfur coal alternative.

Competition, from natural gas and within the coal industry itself, coupled with productivity gains as coal mining becomes more automated will drive real coal prices lower over the long term. Most above-market, long-term coal contracts have already expired, leading to sizeable price declines to date.

Coal Prices in North Carolina

North Carolina's power generators buy most of the coal they burn from the Central Appalachia region. In 2002, the average mine-mouth price of coal in this region was $23.08 per ton ($1.09 per mmBtu). Long term, the average mine-mouth price of coal in Central Appalachia will reach $20.64 per ton in real 2001 dollars. The delivered price of coal to North Carolina's power generators closely tracks the mine-mouth price reflecting the short distance between the producing region and the state.

Central Appalachia Minemouth Price of Coal and North Carolina's Delivered Price of Coal by Sector (*2001 Dollars per Million Btu*)



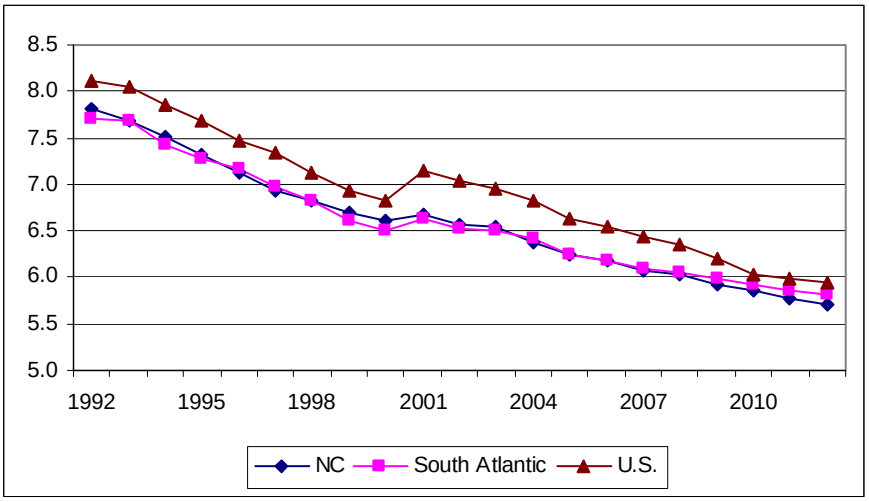
Electricity Price

The U.S. power market continues to be dominated by the same issues that it faced in early 2002. The unraveling of retail competition in California has essentially halted the implementation of retail competition in other states. While many of the problems that plagued California can be attributed to the design of California's competition legislation, unusual weather conditions, and supply constraints, many states have chosen not to open their retail markets to competition. States are concerned that competitive markets will generate volatile retail prices and will lead to supply shortages.

With retail markets in many regions of the country remaining traditionally regulated markets, near-term prices in these regions reflect an embedded cost structure. In regions where retail competition has been implemented, retail prices reflect different pricing methodologies for transmission and distribution (T&D) services and generation services. In these regions, it is expected that in a balanced market, increased competition will put downward pressure on costs and produce market-based retail prices that resemble embedded costs, plus a rate of return.

The amount of the rate of return will vary between hours, days, seasons, and regions, but in the end, generators must earn a positive rate of return in order to compete in the market. T&D prices have historically been based on cost of service. They will remain regulated and will continue to be based on cost of service, with performance-based rate-making (PBR) incentives.

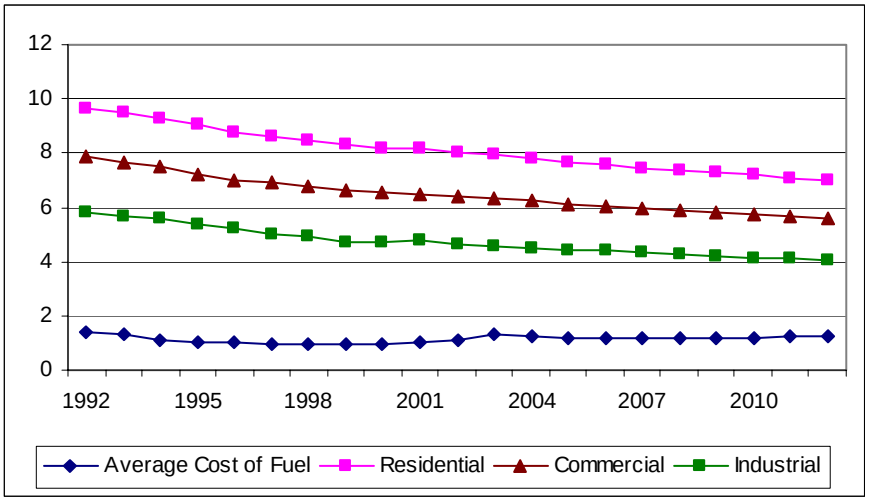
Average Retail Electricity Prices
(2001 Cents per Kwh)



North Carolina's Electricity Price Outlook

Real electricity prices are forecast to fall over time, driven by a variety of changes: competitive pressures, additional capacity in supply-short regions, declining coal prices, and efficiency improvements for new generation technologies. All customer classes will benefit from lower real electricity prices, with price declines averaging roughly similar rates across the residential, commercial, and industrial sectors.

North Carolina's Retail Electricity Prices by Sector and the State Average Cost of Fuel Input to Power Generation
(2001 Cents per Kwh)



In North Carolina, real residential prices will fall from 8.0 cents/kWh in 2002 to 6.1 cents/kWh (2001 dollars) in 2020. Real commercial rates will decline at 1.5% per year over the forecast period (2002-2020). The commercial electricity price in 2020 is expected to reach 4.9 cents/kWh (2001 dollars), down from 6.4 cents per kWh in 2002. Real industrial rates will decline at 1.5% per year to 3.5 cents/kWh (2001 dollars) by 2020, from 4.6 cents/kWh in 2002.

CHAPTER 4: ENERGY CONSUMPTION IN NORTH CAROLINA

Energy consumption in North Carolina will be driven by growth in all sectors. The sector expected to grow the fastest is the transportation sector (2.3% annual growth over the period 2002 to 2020) closely followed by the residential and commercial sectors (each of which are projected to grow at an annual rate of around 2.0%). The industrial sector is projected to grow at a 1.5% annual rate.

Residential

Over the longer term, population and income growth will drive energy demand in the residential sector. The resident population in North Carolina will grow 1.3% annually over the period 2002-2020. Real personal income and disposable income will also increase faster than real wages, due to real increases in non-wage incomes. As the population becomes wealthier, more energy consuming appliances will be used. Although there will be a trend toward more efficient appliances penetrating the average household in North Carolina, the additional demand will be larger than offsetting efficiency improvements. Therefore, as population expands and each person uses more energy each year, total residential energy demand will rise by 2.0% annually between 2002-2020. Residential energy use per person will rise slowly from 36.1 tBtu/capita in 2002 to 40.5 tBtu/capita in 2020.

Total residential energy demand grew 3.4% annually between 1990 and 2000. Over the more recent past, between 1995 and 2000, declining real energy prices combined with growing housing stocks caused demand to grow 2.1% per year. The strength of demand growth in the sector is led by demand for electricity, natural gas, and propane. By 2010, total residential energy consumption is expected to exceed 358 TBtu. Electricity and natural gas will capture most of the demand increases over the forecast period.

As residential fuel consumption rises, **efficiency** in the sector will improve slowing overall growth. The consumption per household of direct fuels, which consist of LPG, distillate, wood, and natural gas, will remain constant over the forecast period as a result of increased demand counterbalanced by increasing energy efficiencies. Electricity use per household will increase, as further use of electrical appliances in the home will boost electricity demand faster than the offsetting effects of more efficient appliances.

Petroleum products as a group will increase 1.6% per year over the forecast period. Petroleum's market share will decline from 19% in 2002 to less than 18% in 2020. Consumption of distillate fuel will increase at a 0.8% annual rate between 2002 and 2020, while demand for kerosene will increase at a 1.3% annual rate. Demand for propane is expected to increase 2.2% per year over the forecast period, and it will become the dominant petroleum product in the

residential sector. Propane surpassed demand for distillate in 2000, and will continue to supplant it over the forecast period. By 2010, propane demand will have increased 6.0 TBtu over its 2002 level. Sales of propane are unregulated in North Carolina and the growth potential of the market is significant because it is more versatile than home heating oil.

Technological advances in **natural gas** heating systems will provide a boost to gas demand over the forecast period. The share of natural gas in residential demand will increase from 21.3% in 2002 to 21.8% in 2010. In order to gain that share of residential demand, 13.9 TBtu more of natural gas will be consumed in 2010 than in 2002, resulting in an annual increase in demand of 2.2%.

Electricity is the dominant residential fuel, with 54.5% of the market in 2002. Its share is expected to increase over the forecast period to over 55% due to increased penetration of electric appliances and fuel switching away from oil products. Increased use of cooling systems will also foster an increase in electricity consumption over the forecast period. Final residential demand is expected to reach 236 TBtus by 2020, causing an annual rate of increase in residential electricity demand of 2.0% (2002-2020).

Wood use in the residential sector should increase in absolute terms over the forecast period at an average annual rate of 1.6% per year. This increase, however, will be slower than the increase in energy demand for the sector as a whole. Thus, the share of wood will decline slightly from 4.8% in 2000 to 4.7% in 2010. While wood is a plentiful source of fuel in North Carolina and there are initiatives to expand its use, it will remain a marginal source of energy for home heating due to its lack of convenience compared to natural gas and electricity. As urban areas expand, wood use as a primary fuel is expected to decrease. However, it will be increasingly used as a secondary fuel in fireplaces and wood stoves. Its use is expected to increase 33% over the forecast period, to approximately 16.9 TBtu by 2010.

North Carolina is a major center in the country for **solar** research and information dissemination. Its position as such will enable it to expand the use of active and photovoltaic (PV) solar technologies faster than in the country as a whole. The use of solar, however, will be limited by its unfavorable economics compared to traditional fuels. Typically, homeowners are reluctant to embrace technologies with long payback periods, and advances in photovoltaic are unlikely to materially change the economics of solar energy over the forecast period. Thus, we expect solar to increase gradually, but it will only retain its current marginal share of the market at 0.2%.

Commercial

Commercial sector energy consumption in North Carolina will grow faster than the national average over the forecast period as North Carolina continues to be a magnet for job growth. This growth is reflected in the expected increases in non-manufacturing employment, outpacing the actual decline in job growth in the

manufacturing sector. In 2002, non-manufacturing employment represented 79% of total employment, and is projected to rise to 83% by 2010.

In the non-manufacturing sector, services, trade, and state and local governments make up the bulk of employment in North Carolina. Both services and governmental employment will grow faster than the non-manufacturing sector overall, emphasizing the changing nature of the commercial sector in North Carolina. Together these two sectors will grow from 41% of all employment in 2002, to 44% in 2010.

The unemployment rate in the state is projected to return to levels experienced during the 1990s. This level will tend to put upward pressure on wages throughout the forecast period, forcing companies to look for alternative cost-cutting measures. In the commercial sector, this will mean reducing the energy use per employee, or per square foot of commercial space. Increased business activity will largely offset any conservation gains made, however. **Total commercial sector energy demand** is thus expected to rise by 1.9% annually between 2002 and 2020. This represents an increase of 39% over 2002 levels.

In terms of **efficiency** in energy use, commercial energy consumption per person is forecasted to grow at an annual rate of 0.5% between 2002 and 2020 while commercial energy consumption per employee is projected to grow at a similar rate over the same time period.

As in the residential sector, use of **petroleum products** will decline over the forecast period. While the decline in oil use will be gradual, the share of oil in the fuel mix will drop from 10.6% in 2002 to 8.2% in 2020. Of the different oil products, distillate fuel represents the majority of current oil demand in the commercial sector, 64% in 2002. Its share of the market is expected to slightly decrease. By 2020, distillate's share of petroleum product demand will increase to below 60%. Many of the same market and environmental forces that are present in the residential sector are also at work in the commercial sector. These will cause LPG demand to increase sharply over the forecast period. Its status as a premium fuel compared to other oil products will allow it to increase its penetration as an oil product, but competition from natural gas and especially electricity will prevent it from increasing its share of total sectoral demand.

The current **natural gas** demand level of 41 TBtu represents 20% of the total demand for commercial fuels in 2002. Demand for natural gas should increase considerably over the forecast period as infrastructure constraints are reduced. Its level of use in the sector will increase along with other demands, leaving natural gas with the same level of market share in 2010, representing an annual demand increase of 0.2%.

The share of electricity in the commercial fuel mix has increased steadily over time, from 61% in 1990 to 67% in 2002. The ease of use, coupled with lower prices, will contribute to the increasing use of electricity as further penetration of computers and other electrical appliances into the market. By 2010, electricity

will capture over 68% of the entire commercial market. Over the forecast period, electricity demand in the commercial sector will rise 2.1% annually between 2002 and 2020.

Industry Excluding Agriculture

Between 1990 and 2000, industrial output grew an average 4% annually. Over the forecast period 2002-2020, this rate will slow to 2.3% as more of the North Carolina economy moves into the non-manufacturing service field. In addition, increased automation and worker productivity will help support further output increases with a shrinking manufacturing workforce. Between 1990 and 2000, manufacturing employment grew an average rate of only 0.3% per year; over the period 2002-2020 manufacturing employment is projected to decline at a rate of 0.5% per year. The mix of manufacturing that goes on inside the state will change as well, moving more toward higher value added industries as cheaper energy is available in other states close to the production centers for energy intensive industries.

Based on these trends, **total industrial sector energy demand** is expected to trail that of the residential and commercial sectors. Between 1990 and 2000, industrial energy demand grew at an annual rate of 2.1%. Over the forecast period 2002-2020, this should grow 1.3% per year. Higher energy prices in North Carolina, as compared with energy producing states, will encourage conservation and the employment of more energy efficient processes. Thus, the annual increases in energy demand will be much lower than the increases in industrial output.

In terms of **efficiency** in energy use, industrial energy consumption per person will hold flat between 2002 and 2020 while industrial energy consumption per unit of output will decline at 2.6% annual rate over the same time period.

Unlike the residential and commercial sectors, **petroleum products** are expected to continue to experience some growth in the industrial sector over the forecast period. As a whole, the demand for oil products should rise 0.3% annually between 2002 and 2020, while residual fuel use will fall 0.2% per year and distillate will decline 0.3% per year. Demand for propane should remain relatively flat, increasing only 0.5% per year over the 2002-2020 period. It will experience strong competition from natural gas, especially as investments are being made in natural gas supply infrastructure as exemplified by the recent substantial bond issuance directed towards providing additional natural gas supplies to those regions of the state without current access.

Natural gas demand in the industrial sector will experience strong demand as industrial operations move from fuels such as coal to cleaner fuels like natural gas. Since many industrial customers use interruptible contracts and do not rely on distribution systems, they pay considerably less for their gas than residential or commercial customers do. These factors will allow demand for natural gas to experience strong growth over the forecast period. Natural gas demand is expected to expand 1.7% annually between 2002 and 2020, capturing an

increasing share of the fuel mix. Indeed, its share should grow from 23% in 2002 and 25% by 2020.

Automated equipment and controlled heat applications will drive industrial **electricity demand** over the forecast period. Over the past 10 years, electricity demand grew 0.9% per year. As more industry introduces electrically powered machine drives, electricity demand will increase at an annual rate of 2.2% over the 2002-2020 period. Current (2002) electricity demand levels of 106.1 TBtu's represent 26% of the industrial fuel market. By 2010, industrial electricity demand is expected to be 28% of the fuel mix.

Industrial **wood** use is significant at 77 TBtu in 2002. State incentives and pilot programs designated to integrate wood as an industrial fuel were very successful and were largely responsible for its large share of demand. Indeed, wood is a cheap and plentiful resource in North Carolina and its use as an industrial fuel provided a secure energy source. Furthermore, the state's furniture manufacturing provides a large source of scrap wood and wood dust that can be converted to energy. Increased penetration of wood, however, is limited because of its burning efficiency, air quality concerns, and the inconvenience of employing it compared to gas, electricity or coal. Demand for the fuel will grow over the forecast period, but much more slowly than energy consumption in the sector as a whole. Demand will grow at 1% per year between 2002 and 2020.

Agriculture

The agricultural sector is an important energy consumer in the state of North Carolina. The sector’s energy consumption is driven by the demands created by farm equipment and irrigation systems.

Electricity will be the strongest area of growth at 3.1% per year over the period 2002-2020, as power is needed for industrial equipment and irrigation systems. The demand for natural gas will be fairly strong through its use as a fuel for heating and cooling. It is projected to grow at a 1.6% annual rate. Petroleum use will be largely driven by the need to operate farm equipment.

Transportation

Petroleum currently dominates transportation sector fuel use and will continue to do so over the forecast period. Although there were several pieces of energy-related legislation passed a dozen years ago that were designed to alter the types of fuels used in transportation (the Clean Air Act Amendments of 1990 and the Energy Policy Act (EPAct) of 1992), the impact on the market has been negligible. That said, national and state efforts continue, and over the forecast alternatively fueled vehicles are expected to be fueled using compressed natural gas (CNG), propane, biodiesel, and ethanol.

In terms of **efficiency** in energy use, transportation energy consumption per person will grow at an annual rate of 1.0% between 2002 and 2020.

Transportation energy consumption per person can be further analyzed in terms of on-road transportation energy consumption per person and off-road transportation energy consumption per person. On-road energy transportation consumption per person is expected to grow at an annual rate of 0.9% while off-road energy transportation consumption per person is projected to grow at an annual rate of 2.3%.

Total demand for transportation fuels has grown at an average annual rate of 2.8% since 1990 in North Carolina. Growth since 1995 has been slightly higher, averaging 3.3% annually making the transportation sector the largest end-use demand sector in the state. Population and the economic growth of the state will be the main drivers for energy in the transport sector during the forecast. Vehicle miles traveled (VMT) are set to grow 2.2% per year, leaving 2010 levels nearly 20% higher than in 2002.

Oil products accounted for 99% of the energy consumed in this sector in 2002 and will maintain near this level of market dominance throughout the forecast. Among the various oil products, motor gasoline demand is the largest, although distillate fuel (diesel) is also growing rapidly. Jet fuel demand will increase at an annual 4.3% rate between 2002 and 2020 as regional hub-airports like Charlotte and Raleigh-Durham continue to expand.

The overwhelming majority of **natural gas** used in the transportation sector is used to power the pipeline delivery system. As natural gas usage in the state increases, especially with regard to the electric power industry, natural gas used for transporting this fuel will also increase. As owners of vehicle fleets expand their use of natural gas vehicles, this segment will also rise, but only at a moderate rate. In total, natural gas use in the transportation sector amounted to 7.2 TBtus in 2000. This total will increase more slowly in the early years of the forecast, but will rise rapidly with the continued adoption and increased use of natural gas fired electricity generation facilities in the state later in the forecast.

Power Generation

North Carolina's prosperous economic outlook and strong population growth will drive electricity demand steadily upwards. Electricity demand grew an average 2.9% per year between 1990 and 2000. However, since 1995, total electricity demand has slowed to a 2.7% annual growth rate. Over the forecast period, while demand will be strong, it will not grow at its historic pace. Between 2002 and 2020, electricity demand growth is projected to increase 2.1% annually. As a result of this growth, fuel demand growth for the power generation sector is expected to be robust.

North Carolina’s **capacity** mix is heavily skewed towards base load generation. Over the forecast, both Carolina Power and Light and Duke Power have announced plans to add capacity to meet peak demand. Peak demand has grown significantly over the recent past. During the next seven years, over 3 gigawatts

of oil and natural gas fired capacity additions are planned. This will predominately be combined cycle and combustion turbine installations. Over the longer term, Global Insight's predicts that 1,800 megawatts (MW) of coal-fired capacity will be built to meet expanding baseload requirements.

North Carolina's **hydro** production depends on streamflow. Thus, hydro utilization fluctuates over history. Over the forecast period, hydro utilization is assumed to be constant at its historic average. **Nuclear** power capacity within the state was treated in the same manner. Nuclear utilization factors are much higher in North Carolina than nationally, reflecting the above-average performance of the state's nuclear reactors. For the future of nuclear power in the state, the Brunswick 2 reactor will reach the end of its operating license in 2014, and the Brunswick 1 in 2016. The Harris and McGuire facilities will not reach the end of their current operating licenses until after 2020.

Coal demand will rise over the forecast as base load and intermediate load requirements increase. Utilization rates of coal-fired facilities will increase over time as the utilities continue to work towards more efficient operations. Higher utilization rates will increase the coal input until the end of the forecast period when additional coal capacity is forecast to come on line. This will also increase coal demand by the electric power industry.

Natural gas and distillate are expected to grow as peaking capacity is added. In addition, as these new facilities are transitioned to cover intermediate load, the utilization of the oil and gas facilities will increase. As a result, demand for both fuels will increase sharply after 2005 when peak demand drives the need for additional capacity additions.

Use of other fuels, including **renewable** sources, is also expected to expand. Increasingly, the use of renewable fuels will be determined by economic factors. Improvements in heat rates could have an enormous impact on variable production costs for these plants. If technological advances or economic incentives are not forthcoming, however, these fuels will remain a marginal source for power generators.

Emissions

Emissions of toxic gases and substances pose a serious threat to air quality in North Carolina. In 2002, Governor Mike Easley signed into law the *Clean Smokestacks Bill.* Under the legislation, North Carolina's 14 coal-fired plants must reduce their emissions of key pollutants responsible for the ozone, which are unhealthy to breathe and damage trees and crops; fine particles, which are unhealthy to breathe and cause haze that obscures scenic views and harm tourism; and acid rain, which is harmful to aquatic life, forests, and soils. In particular, the legislation will require power plants to reduce:

- Nitrogen oxide (NO_x) from 245,000 tons in 1998 to 56,000 tons by 2009 (78%). NO_x is the main cause of ozone and contributes to acid rain and haze.

- Sulfur dioxide (SO_2) emissions from 489,000 tons in 1998 to 250,000 tons by 2009 (49%) and 130,000 tons by 2013 (74%). SO_2 is the main cause of fine particles, haze, and acid rain.

In addition, the legislation requires the North Carolina Division of Air Quality to conduct a study of mercury and carbon dioxide emissions in the state. As an added benefit, the equipment needed to reduce SO_2 emissions is expected to cut mercury emissions by about 50%. Airborne mercury eventually winds up in streams and lakes where it can accumulate in certain kinds of fish, making them unsafe to eat.

Utility companies will be required to cut their emissions year-round at power plants within North Carolina. The legislation differs from federal rules, which only apply during the ozone season (April through October), and allows utilities to buy or trade pollution credits from other states instead of cutting air pollution from plants in North Carolina.

The legislation will yield important health benefits for citizens of North Carolina and other states by significantly reducing pollution events that can trigger asthma and other respiratory problems. The cuts in both SO_2 and NO_x emissions are expected to reduce acid rain and serve as a significant step toward meeting the new federal fine particle and ozone standards in North Carolina. The cuts will also help to improve visibility in the mountains and other scenic areas.

Another pollutant of increasing concern is CO_2, a greenhouse gas. Carbon dioxide emissions from the combustion of coal, oil, and natural gas have been growing steadily in North Carolina and across the nation. Carbon dioxide emissions in 2000 were 44.6 million tonnes, and are projected to grow to 67.9 million tonnes by 2020.

CHAPTER 5: COMPARISON OF NORTH CAROLINA ENERGY PRICE, CONSUMPTION, EXPENDITURES

The state of North Carolina has an energy profile that is distinct from the other South Atlantic states and the United States as a whole.

Residential Sector

Total residential energy consumption per capita in North Carolina will grow at a slower rate than for the United States and the slower than the South Atlantic region as a whole. Residential energy prices in North Carolina will increase at about the same rate as the rest of the country.

Residential Energy Sector

	North Carolina	South Atlantic*	United States*
Consumption (% growth 2002-2020)			
Electricity	2.0	2.4	2.1
Natural Gas	2.2	2.9	1.4
Distillate Fuel	0.8	-0.6	-0.1
Propane	2.2	1.2	0.8
Total	2.0	2.3	1.5
Total per Capita	***0.6***	***1.1***	***0.7***
Retail Prices, Nominal (% growth 2002-2020)			
Electricity	0.9	1.3	1.1
Natural Gas	1.9	1.9	2.1
Distillate Fuel	3.1	3.1	3.1
Propane	3.1	--	--

**Source: Global Insight's U.S. Energy Outlook, Winter 2002-2003*

Commercial Sector

Commercial electricity in North Carolina will grow at a slower rate than for the South Atlantic states, while natural gas is projected to grow somewhat more slowly. Commercial sector energy prices in North Carolina will increase slightly slower than for the South Atlantic states and the United States.

Commercial Energy Sector

	North Carolina	South Atlantic*	United States*
Consumption (%growth 2002-2020)			
Electricity	2.1	2.3	1.9
Natural Gas	1.8	1.8	1.1
Distillate Fuel	-0.1	-0.1	-0.5
Residual Fuel	-0.3	-2.2	-1.1
Total	1.9	2.1	1.4
Total per Capita	***0.5***	***0.9***	***0.6***
Retail Prices, Nominal (%growth 2002-2020)			
Electricity	0.9	1.4	1.0
Natural Gas	2.0	2.0	2.2
Residual Fuel	2.8	2.8	2.7

**Source: Global Insight's U.S. Energy Outlook, Winter 2002-2003*

Industrial Sector

Industrial natural gas consumption in North Carolina will grow at a faster rate than for the South Atlantic states or the rest of the nation. It will grow at a slower rate for electricity. Industrial sector energy prices in North Carolina will increase at a slower rate than the other South Atlantic states or the nation as a whole.

Industrial Energy Sector

Sector	North Carolina	South Atlantic	United States
Consumption (%growth 2002-2020)			
Electricity	2.3	2.3	2.2
Natural Gas	1.7	1.5	1.4
Petroleum	0.5	0.3	0.4
Total	1.4	1.3	1.2
Total per $GSP	-2.6	-2.6	-2.1
Retail Prices, Nominal (%growth 2002-2020)			
Electricity	0.9	1.5	1.0
Natural Gas	2.6	2.6	2.7
Coal	2.0	2.1	1.6
Distillate Fuel	3.3	3.3	3.3
Residual Fuel	2.8	2.8	2.8

**Source: Global Insight's U.S. Energy Outlook, Winter 2002-2003*

Transportation Sector

The consumption of energy in the transportation sector can be divided into two categories: on-road and off-road. From 2002 to 2020, on-road energy consumption is forecasted to grow at a 2.4% annual rate in the state of North Carolina. In the United States as a whole, on-highway gasoline demand is projected to grow at a 1.7% annual rate between 2002 and 2020. In North Caroline, off-road demand is expected to grow at a 3.1% annual rate, while it will grow 2.6% nationally.

Transportation Sector

	North Carolina*	United States*
Consumption (%growth 2002-2020)		
VMT	2.2	1.9
On-road: Gasoline	1.7	1.6
On-road: Diesel	4.0	1.5
Total On-road	2.2	1.6
Total Off-road	3.1	2.6
Total Sector	2.3	1.8

**Source: Global Insight's U.S. Energy Outlook, Winter 2002-2003*

Electric Power Sector

Fuel consumption by power generators will grow faster in North Carolina than in the South Atlantic region and the U.S. Fuel prices in North Carolina will track prices in other regions.

Fuel Consumption and Prices to Power Generators

	North Carolina	South Atlantic*	United States*
Consumption (%growth 2002-2020)			
Natural Gas	9.8	5.5	2.9
Petroleum	2.0	-0.4	0.8
Coal	2.8	1.6	1.2
Nuclear	0.3	-0.1	-0.7
Hydro	0.0	-0.7	0.2
Total	2.1	1.6	1.1
Total per $GSP	-1.9	-2.3	-2.1
Retail Prices, Nominal (%growth 2002-2020)			
Natural Gas	2.8	2.8	3.1
Distillate Fuel	3.2	3.2	3.2
Residual Fuel	5.8	2.6	2.6
Coal	1.9	1.9	1.5

**Source: Global Insight's U.S. Energy Outlook, Winter 2002-2003*

CHAPTER 6: STATE ENERGY PLAN AND THE POTENTIAL FOR ALTERNATIVE ENERGY RESOURCES AND CONSERVATION TO LIMIT EXPENDITURES ON ENERGY

Energy Plan Objectives

The purpose of the State Energy Plan is to set forth recommendations for policies and programs related to energy. Currently, the state of North Carolina imports an extremely high percentage of its fuel sources which places a substantial strain on the state's economy. In addition, the state's natural landscape is adversely affected by acid rain and other forms of pollution that result from its current generation sources.

In order to achieve the above-stated goal, the State Energy Plan has six major objectives:

1. Ensure Energy Reliability for Citizens of North Carolina
2. Improve Environmental Quality and Public Health in North Carolina
3. Develop Policies that Promote Wise Land Use
4. Implement Strategies Supportive of a Sound North Carolina Economy
5. Develop an Achievable Energy Strategy for North Carolina
6. Implement a Strategy by which the State Can Lead by Example

The objectives of the State Energy Plan are described in more detail in the table on the next page.

Global Insight's Analysis and Recommendations

The State Energy Plan advances numerous policy initiatives. It is a fair assumption that there will not be sufficient funding to implement all of these initiatives. Therefore, these initiatives need to be carefully evaluated and prioritized. This section will present Global Insight's assessment of the impact these initiatives will have on North Carolina's energy outlook and our recommendation and rationale for their prioritization.

Summary of State Energy Plan

Ensure Energy Reliability for Citizens of North Carolina

- The state's energy supply system must be designed so as to be able to withstand natural and man-made disasters.
- Careful preparation must be made to address security threats, with particular attention directed at nuclear facilities.
- There must be a diverse electricity supply that will allow the state to alternate among multiple energy sources as the need arises.
- The energy infrastructure must be maintained, and if necessary, expanded. This means that the electricity transmission and distribution systems and natural gas pipelines must be kept in a state that will allow the free flow of energy when needed.

Improve Environmental Quality and Public Health in North Carolina

- Significant improvements need to be made in reducing air pollution from electric generating plants and in controlling acid rain that contaminates rivers and streams.
- It is critically necessary to decrease the use of fossil fuels as an energy source as they lead to the emissions of greenhouse gases such as carbon dioxide and methane and ultimately global change.
- Air pollution must be reduced so as to curb the rise in respiratory disease in the state. Asthma and bronchitis are the most prevalent childhood diseases in the state.

Develop Policies that Promote Wise Land Use

- Inefficient commuter patterns lead to unnecessary fossil fuel use in the transportation sector and a reduction in job productivity. Better urban planning is essential to effectively address this issue.
- Downtown areas of cities and small municipalities need to be strengthened in order to attract residents and businesses. This can be accomplished by the expansion of mass transit facilities.
- Tree and vegetative population must be preserved so as to reduce greenhouse gas emissions by absorbing carbon dioxide. This means that urban development must be carefully monitored and controlled.
- The use of agricultural crops and waste products for fuel would greatly bolster the ailing tobacco and hog industry by increasing the demand for their products.

Implement Strategies Supportive of a Sound North Carolina Economy

- A diverse and competitive energy industry is an essential underpinning for a vibrant North Carolina economy. Programs to promote diversity and competition are necessary to accomplish this.
- Energy efficiency measures and development of energy resources within the state including biomass, hydropower, wind, waste-derived fuels, solar energy, and other statewide energy resources will increase North Carolina's energy independence and allow energy dollars to stay within the North Carolina economy.
- Energy-related industries are an important source of employment. The state should promote the development of energy-related industries so as to create employment opportunities for North Carolina citizens.
- Energy costs are a significant cost to many businesses. A reliable and competitively priced electricity supply is necessary to foster the development and expansion of businesses in North Carolina.
- Lower prices can be achieved by giving North Carolina energy consumers expanded choice in their electricity purchase decision. Retail choice must become a prominent part of the energy equation.
- One of the hallmarks of a sound economy is that low-income households participate in the economic benefits. This requires that energy costs are not prohibitive for low-income families. Weatherization, high performance new affordable housing, and low-income energy assistance programs must be instituted to aid low-income families.

Develop an Achievable Energy Strategy for North Carolina

- The State Energy Plan must be dynamic. It cannot be developed just once and left unchanged. It needs to be constantly monitored, tracked, and changed frequently.
- There needs to be careful coordination between the different agencies of state government to be sure that program redundancies are minimized and effective complementary measures are undertaken.
- Sustainable energy technologies are a key ingredient of the State Energy Plan. The most promising technologies need to be identified and promoted.

Implement a Strategy by which the State Can Lead by Example

- State-owned buildings should exemplify energy efficiency and renewable technologies.
- Financing options should be pursued in the public sector such as performance contracting.
- The state should take a lead role in promoting high efficiency and clean alternative fuels in state-owned vehicles.
- North Carolina schools should be teaching tools for energy efficient technologies and school buildings should be facilities and house systems that provide energy directly, such as renewable technologies and fuel cells. School curricula should emphasize the important role that energy plays in the economy.

Source: Energy Policy Working Group Energy Plan (http://www.ncenergy.appstate.edu)

Public Sector

In Global Insight's view, the following initiatives show the greatest promise for energy savings in the public sector:

- Implement *High Performance Building Guidelines* developed for North Carolina in all new public housing and public buildings.
- Reduce energy use in existing public buildings to save a recurring $7 million per year or more. By 2005, reduce energy use in existing public buildings by 20%.
- Develop *performance contracting* procedures and other ways to finance energy efficiency projects for state and local governments, university and public school systems, and public housing. Provide technical support to implement performance-contracting projects and provide quality assurance.
- Require a 20% reduction in petroleum use by state government fleets by December 2006.
- Develop a *financial incentive* program for highly efficient vehicles, such as a $250 to $500 payment per new vehicle in government fleets that improve efficiency over 20% per vehicle.
- Require that public buildings purchase a minimum percentage, such as 10%, of their electricity needs from *renewable energy sources*, through participation in the *NC GreenPower* program. Public buildings should also generate renewable electricity for their own use and provide renewable electricity as a source of power for the *NC GreenPower* program.

North Carolina's Public Sector energy expenditures were estimated to be more than $500 million in FY 2000-2001. Approximately 88% of this is attributable to energy consumption in public buildings. The remainder is attributable to transportation consumption. Electricity consumption in the public sector rose almost 7% from FY 1997-1999. To reduce this growth rate, the components of public sector energy consumption must be carefully analyzed. Heating and cooling account for a large percentage of the energy use in public buildings. Improving public building design standards and initiating performance contracting will be very cost-effective energy efficiency measures. The state of North Carolina is currently using high performance building guidelines at the Triangle J Council of Governments. The *High Performance Guidelines: Triangle Region Public Facilities* Program builds upon past successes in identifying ways to increase energy efficiency in public buildings in the Triangle region. Efforts such as the Wake County *Guidelines for Design and Construction of Energy Efficient County Facilities* illustrate a history of Triangle involvement in keeping

architects, engineers, and facility managers abreast of the latest standards for achieving high performance, cost effective buildings. Also, developing financial incentives for highly efficient vehicles and targets for alternative fueled vehicles should be vigorously pursued.

On the supply side, the public sector can contribute to the development of renewable energy sources. *Requiring a minimum of 10% of the energy used in the public sector be purchased from renewable sources by 2006 will be significant in allowing the state of North Carolina to become more energy independent*. Such a statutory requirement is currently being considered in Massachusetts.

The public sector is a fairly significant contributor to commercial energy consumption in North Carolina. Therefore, reducing public sector energy use can make a meaningful contribution to reducing commercial energy consumption in North Carolina. The current version of the Energy Plan assumes that energy consumption in public buildings can be reduced by an average of 4% per year in the foreseeable future. This is an aggressive goal and it is unlikely that it can be achieved.

Global Insight believes that in the absence of these initiatives, commercial sector energy consumption is expected to grow on average by 1.6% per year between 2000 and 2020. Based upon experience with aggressive building design and performance contracting in Massachusetts, commercial energy consumption could be reduced to the 1.1% to the 1.3% per year range if all measures were fully funded. This was the experience in Massachusetts in the late 1990s.

Residential Sector

The Energy Policy Working Group feels that substantial energy savings are available in North Carolina's residential buildings. In Global Insight's view, the following initiatives show the greatest promise for energy savings in the residential sector:

- Assess recently completed residential buildings for *energy code compliance*, as well as other energy-related characteristics. Make recommendations for energy code changes that are cost effective in terms of energy savings versus installed costs. Determine improvements in the energy code inspection process that are needed to achieve improved compliance.

- Develop standards and publicity campaigns for a statewide *Energy Star* program. Provide incentives such as tax credits or direct payments for new residential or commercial buildings.

- Develop a *North Carolina Energy Star program* to improve the efficiency of affordable housing built in the state. Provide targeted training, technical assistance, and financial assistance to achieve

maximum market penetration of Energy Star buildings for affordable housing.

- Establish minimum efficiency guidelines for *manufactured housing* sold in North Carolina. Provide incentives, such as tax credits or direct payments, for Energy Star manufactured homes.

- Develop a program to increase the efficiency of existing residential buildings, such as *energy audits tied to tax credits or direct incentive payments.*

- Strengthen the *Low Income Weatherization* program to optimize the energy efficiency work being performed in the field. Assess the practicality of establishing a goal to weatherize all low-income homes and residential units by 2015.

In 2001, the residential sector accounted for 17% of North Carolina's energy consumption. Electricity accounted for 55% of the energy usage while natural gas accounted for 20%. Residential energy end use in North Carolina in 2001 can be described as follows:

- Lighting-24%
- Water Heating-24%
- Space Cooling-22%
- Space Heating-23%
- Appliances-7%

As one can see, residential energy use in North Carolina is distributed predominantly across lighting, heating, and cooling end-uses. Therefore, initiatives that address these specific end uses will be most effective. Enforcing more rigidly and expanding energy code compliance will be very effective in reducing residential sector energy consumption. Also, promoting energy audits through tax credits and direct incentive payments will have a significant impact. The energy audit program currently in effect in Massachusetts has been very successful in reducing residential energy consumption in Massachusetts.

A lighting rebate program needs to be an essential part of the residential sector in the Energy plan. The rebates should be offered for both energy efficient fixtures and bulbs. The rebates for fixtures should be more generous than those for bulbs as once the fixtures are in place, the market will be driven to purchase more effective bulbs. Residential lighting programs in Massachusetts have been very instrumental in reducing lighting consumption. Penetration rate studies and Delphi surveys should be conducted in North Carolina to evaluate the potential effectiveness of lighting rebate programs.

Participation in the various ENERGY STAR programs is another fruitful way of reducing residential energy consumption in North Carolina. There are three major

ENERGY STAR Programs: ENERGY STAR Products, ENERGY STAR Homes, and ENERGY STAR Buildings.

ENERGY STAR Products

The ENERGY STAR Products program makes it easy for consumers to identify high quality, energy-efficient products for their homes and offices. Under the program, almost 7,000 individual product models in 31 consumer product categories are ENERGY STAR qualified. The following table shows the energy saved and emissions prevented for various product categories.

Energy Star Products 1999 Achievements

Product	Energy Saved (billions kWh)	Emissions Prevented (MMTCE)*
Computers	2.7	0.5
Monitors	12.5	2.5
Printers	4.2	0.9
Copiers	0.9	0.2
Other Office Products	3.6	0.6
Exit Signs	2.2	0.4
Residential Fixtures	2.0	0.4
Home Electronics	0.9	0.2
Other Products	0.2	0.1
Total	**29.2**	**5.8**

**Million Metric Tons Carbon Equivalent Per Year*
Source: http://www.energystar.gov

- As of the end of 2000, more than 630 million products with the ENERGY STAR label were purchased.
- By choosing *ENERGY STAR*, consumers can save 30% on their energy bills - about $400 per year - and protect the environment for future generations.
- In 2000, Americans saved more than $5 billion on energy bills.
- In 2001, the ENERGY STAR label was extended to supermarkets and grocery stores that perform in the top 25% of the market.
- In 2001, ENERGY STAR for set-top boxes and residential dehumidifiers were introduced.

ENERGY STAR Homes

New homes that bear the ENERGY STAR label incorporate features such as improved insulation, tightly sealed construction, sealed ducts, high-performance

windows, and high-efficiency heating and cooling equipment. These homes are generally 30% more energy efficient than the Model Energy Code. According to the ENERGY STAR website (http://www.energystar.gov), the major accomplishments of the Program in recent years include:

- In 1999, over 8,000 new homes qualified as ENERGY STAR. This was an increase of more than 50% over 1998.
- ENERGY STAR labeled homes have averaged over 35% in energy-use reductions.
- In 1999, the threshold of 1,000 building partners was crossed.
- In 1999, more than 800 industry allies, including approximately 40 utilities, signed agreements to promote ENERGY STAR Homes.
- In 1999, the manufactured housing sector, representing about 30% of all new housing, began participating in the program.
- In 1999, energy savings were sufficient to power ten million homes and reduce air pollution equivalent to taking ten million cars off the road.
- In 2000, ENERGY STAR begins to offer the Home Improvement Toolbox to make it easy for homeowners to incorporate ENERGY STAR into their home improvement or repair projects.

ENERGY STAR Buildings

ENERGY STAR Buildings collaborates with a wide range of building owners and users - retailers, healthcare organizations, real estate investors, state and local governments, schools and universities, and small businesses. Each partner commits to improving the energy performance of its organization and uses the performance metrics and tools provided by ENERGY STAR to achieve significant savings in both dollars and air pollution. According to the ENERGY STAR website, recent accomplishments include:

- More than 7,000 private and public sector organizations have partnered with EPA to improve their energy performance representing more than 600 buildings or 17% of the total commercial, public, and industrial building market.
- Partners have saved more than 22 billion kWh of energy, reduced energy bills by at least $1.6 billion, and prevented emissions of at least 4.5 MMTCE.

- Cumulative investments in energy-efficient technologies have totaled more than $3.6 billion.

- Over 1.6 billion square feet of investor-owned office properties have joined ENERGY STAR, representing over 70% of the office properties market.

- By choosing *ENERGY STAR*, businesses and organizations could save more than $25 billion per year on their energy bills and protect the environment for future generations.

- Installing ENERGY STAR labeled computers, monitors, fax machines, copiers, or printers saves approximately $80 per product per year, and prevents pollution.

The low-income weatherization program is another effective way of reducing residential sector energy consumption. In addition to reducing energy use, it also provides financial assistance to low-income families. This program has been highly effective in reducing energy consumption for low-income families in Massachusetts.

Global Insight believes that in the absence of the initiatives discussed above, energy consumption per person in the residential sector is expected to grow on average by 0.6% per year between 2000 and 2020. Based upon experience with similar programs in Massachusetts, energy consumption per person in the residential sector could be reduced to the 0.2% to the 0.4% per year range if the above recommendations are fully funded. This was the experience in Massachusetts in the late 1990s.

Commercial Sector

The Energy Policy Working Group feels that substantial energy savings are available in North Carolina's commercial buildings. In Global Insight's view, the following initiatives show the greatest promise for energy savings in the commercial sector:

- Assess recently completed commercial buildings for *energy code compliance*, as well as other energy-related characteristics. Make recommendations for energy code changes that are cost effective in terms of energy savings versus installed costs. Determine improvements in the energy code inspection process that are needed to achieve improved compliance.

- Provide *incentives such as tax credits* or direct payments for new or existing commercial buildings.

- Develop a program to increase the efficiency of existing commercial buildings, such as *energy audits tied to tax credits or direct incentive payments.*

- Promote and develop guidelines for successful *performance contracts*, and conduct workshops and provide technical assistance on developing performance-contracting documents.
- Develop commercial building *energy analysis software* to assist building owners with evaluating the best energy efficiency measures.

The commercial sector accounted for approximately 12% of energy use in North Carolina in 2001. The distribution of energy sources is as follows:

- Electricity-67% totaling 138 Trillion Btu
- Natural Gas-19% totaling 40 Trillion Btu
- Propane-2%, totaling 4 Trillion Btu
- Other Petroleum-10% totaling 21Trillion Btu
- Coal and Renewables (primarily wood) each provide approximately 1%, with each totaling 2 Trillion Btu.

From an electricity consumption standpoint, the most intensive end uses are lighting at 100%, space cooling at 99%, and water heating at 73%. Therefore, many of the initiatives proposed for the residential sector are also proposed here.

With respect to lighting, enforcement and expansion of energy code compliance standards should be aggressively pursued. Currently, problems exist with stringent energy code enforcement. City and county code enforcement agencies assign health, safety, and other aspects of buildings a higher priority than energy efficiency. Also, the energy code is more complex than most other codes. Thus, code enforcement officials have too little, time, training, and priority to enforce the energy code fully. Instead, they often rely on the building's engineering design team to ensure compliance.

Also, granting of tax credits for installation of efficient fixtures and bulbs is necessary. The rebates should be offered for both energy efficient fixtures and bulbs. The rebates for fixtures should be more generous than those for bulbs as once the fixtures are in place, the market will be driven to purchase more efficient bulbs.

The above initiatives offer substantial potential for energy savings. Commercial lighting programs in Massachusetts have been very instrumental in reducing lighting consumption. Penetration rate studies and Delphi surveys should be conducted in North Carolina to evaluate the potential effectiveness of lighting rebate programs.

Space cooling and water heating initiatives should be promoted through performance contracting. Commercial building owners are, in general, very savvy with regard to energy efficiency investments and will be quite responsive to performance contracting arrangements. This has been the case in Massachusetts, Connecticut, and New York.

Many commercial buildings have energy managers. These managers are very knowledgeable with regard to energy saving technologies and are generally quite amenable to energy audits and the use of energy analysis software. Depending upon their level of expertise, energy managers will either utilize the software themselves, or obtain the services of a contractor to perform the analysis for them. In either case, audits and the use of energy analysis software are a very effective way of motivating building owners to undertake energy saving measures.

Global Insight believes that in the absence of the initiatives discussed above, commercial sector energy consumption is expected to grow on average by 1.6% per year between 2000 and 2020. Based upon experience with these programs in Massachusetts, commercial energy consumption could be reduced to the 1.2% to the 1.4% per year range if the above-recommended initiatives are fully funded. This was the experience in Massachusetts in the late 1990s.

Industrial Sector

North Carolina's industrial sector uses more energy than any sector other than transportation sector. The development of policies that support industrial energy use efficiency is a crucial component of retaining a strong manufacturing economy and will directly support the goals of the State Energy Plan. In Global Insight's view, the following initiatives show the greatest promise for energy savings in the industrial sector:

- Develop incentives, such as *tax credits or direct payments*, for energy efficiency measures in new or existing industrial facilities, such as upgrading to higher efficiency motors; installing higher efficiency lighting, hot water, heating, cooling, and ventilation systems; and improving industrial processes.

- Expand the *Industrial Extension Service (IES), Industrial Assessment Center (IAC)*, and related industrial energy outreach, training, and technical assistance activities. Increase funding to assist industries through the procurement process for installing energy measures when indicated by an energy audit.

- Promote and develop guidelines for successful *performance contracts*, and conduct workshops and provide technical assistance on developing performance-contracting documents.

- Assess recently completed industrial buildings for *energy code compliance*, as well as other energy-related characteristics. Make recommendations for energy code changes that are cost effective in terms of energy savings versus installed costs. Determine improvements in the energy code inspection process that are needed to achieve improved compliance.

- Provide *incentives, such as tax credits* or direct payments, for the implementation of energy efficiency measures in new or existing industrial facilities.

- Develop a program to increase the efficiency of existing industrial facilities, through *energy audits tied to tax credits or direct incentive payments.*

- Encourage the use of industrial building *energy analysis software* to assist industrial facility owners with evaluating the best energy efficiency measures. Depending upon their level of expertise, energy managers will either utilize the software themselves or obtain the services of a contractor to perform the analysis for them. In either case, audits and the use of energy analysis software are a very effective way of motivating building owners to undertake energy saving measures.

In 2001, the industrial sector in North Carolina was estimated to consume approximately 427 trillion Btu's per year, or 27% of the total energy used in the state. The distribution of energy sources is as follows:

- Electricity-22%
- Natural Gas-22%
- Petroleum-35%
- Wood and Waste-11%
- Coal-8%
- Hydroelectric-2%

In terms of the percentage of industrial consumption by end-use in the Southern region of the United States, the two major end-uses are Process Heat at 24% and Boiler Fuel at 22%.

The potential for energy saving improvements in the industry sector falls into four primary categories:

1. General Energy-Saving Technologies. These are technologies that are applicable to all manufacturing sectors. Examples are high efficiency lighting and computer control of air conditioning.
2. Industry specific Energy-Saving Technologies.
3. Energy Management Activities. Examples are energy audits, load control, and a full-time energy manager.
4. Other Innovative Approaches: changing processes or increasing worker productivity

The most promising area in the commercial and industrial sectors to promote energy efficiency is in renewable energy. Many states have adopted industrial programs and policies to encourage the development of renewable energy sources

by providing incentives to manufacturers. Most states offer numerous financial incentives for the development of renewable energy sources. These incentives fall into the following categories:

- Personal Tax
- Corporate Tax
- Sales Tax
- Property tax
- Rebates
- Grants
- Loans
- Production Incentives

The states of New York, Massachusetts, Oregon, California, and Ohio offer numerous financial incentives for the development of renewable energy resources. A description of major programs in each of these states is presented below. [1]

New York

♦ Energy $mart New Construction Program

The New York State Energy Research and Development Authority (NYSERDA) provides incentives of up to $300,000 per project for the design and installation of building-integrated photovoltaics (BIPV), and up to $100,000 per project for the design and installation of advanced solar and daylighting technologies. Incentives are capped at 70% of the incremental cost of the design and installation of eligible measures for advanced solar and daylighting technologies and the lesser of $5 per watt ac or 70% of the incremental cost of BIPV. The program is scheduled to end on 12/31/03. Upon program evaluation, a decision will be made as to whether or not to continue the program.

♦ Green Building Tax Credit Program

In 2000, New York State passed an innovative Green Building Tax Credit for business and personal income taxpayers. Part II of Chapter 63 of the Laws of 2000 provides for tax credits to owners and tenants of eligible buildings and tenant spaces that meet certain "green standards". These standards increase energy efficiency, improve indoor air quality, and reduce the environmental impacts of large commercial and industrial buildings in New York State.

[1] Database of State Incentives for Renewable Energy (http://www.dsireusa.org)

The total credit amount allocated by the legislature is $25 million to be distributed between 2001 and 2009. Owners and tenants must work through an architect or engineer who will help obtain a credit certificate from the state for their project. The credits are distributed over a five-year period with any unredeemed portion able to be carried forward indefinitely or transferred to a new owner or tenant. Initial credit certificates will be issued between 2000 and 2004.

Projects can qualify for credits under six different program components: 1) *Whole Building Credit* (owner or tenant) where base building and all tenant spaces are green; 2) *Base Building Credit* (owner) for non-dwelling spaces; 3) *Tenant Space Credit* (owner or tenant) where the base building must be green to qualify if the tenant space is under 10,000 square feet; 4) *Fuel Cell Credit* for systems fueled by a "qualifying alternate energy source"; 5) *Photovoltaic Module Credit*; and 6) *Green Refrigerant Credit* for new air conditioning equipment using an EPA-approved non-ozone depleting refrigerant.

The program will expire at the end of 2004. Upon program evaluation, a decision will be made as to whether or not to continue the program.

Massachusetts

- Solar and Wind Energy System Deduction

  Businesses that purchase a qualifying solar or wind-powered "climate control unit" or "water heating unit" are allowed to deduct from net income, for state tax purposes, costs incurred from installing the unit. The installation must be located in Massachusetts and be used exclusively in the trade or business of the corporation.

  Businesses that qualify for this deduction may also qualify for the corporate excise tax exemption on solar or wind powered devices. This exemption is available for the length of the equipment's depreciation period.

- Clustered PV Installation Program

  Six Massachusetts organizations are facilitating the installation of approximately 250 photovoltaic (PV) systems on homes and businesses in clustered regions throughout the state. These organizations will provide outreach activities in their communities and offer installation rebates to lower the PV system purchase cost for consumers. The incentive is partially performance-based in that 70% of the rebate will be paid after the system has successfully operated for 30 days, with the remaining 30% paid as quarterly production payments over three years at a rate of $0.38/kWh of electrical output produced by the PV system. The total production payment is capped at 30% of the installation incentive. The total installation incentive varies from grantee to grantee but is capped at up to $5.00/Watt (AC output).

These six organizations were awarded grants for these activities as part of the Massachusetts Renewable Energy Trust's (RET) $10 million Solar-to-Market Initiative. The RET is the state's public benefits fund administered by the Massachusetts Technology Collaborative (MTC).

This program was instituted in October 2002, and is yet to be evaluated.

Oregon

- Business Energy Tax Credit (BETC)

  Oregon's Business Energy Tax Credit is for investments in energy conservation, recycling, renewable energy resources, or less-polluting transportation fuels. Any Oregon business may qualify. As examples, projects may be in manufacturing plants, stores, offices, apartment buildings, farms, and transportation.

  The 35% tax credit is taken over five years: 10% the first and second years and 5% for each year thereafter. Any unused credit can be carried forward up to eight years.

  Under the pass-through option, a project owner may transfer a tax credit to a pass-through partner in return for a lump-sum cash payment (the net present value of the tax credit) upon completion of the project. The pass-through option allows non-profit organizations, schools, governmental agencies, tribes, other public entities and businesses with and without tax liability to use the Business Energy Tax Credit by transferring their tax credit for an eligible project to a partner with a tax liability.

  Lighting projects must improve energy efficiency by at least 25% to qualify. All rental-property weatherization projects qualify for the tax credit if recommended by a utility or state energy auditor. Other conservation projects must reduce energy use by at least 10%. For new construction, measures are eligible if they reduce energy use by at least 10%, compared to a similar building that meets the minimum requirements of the state energy code.

  Projects that use solar, wind, hydro, geothermal or biomass to produce energy, displace energy, or reclaim energy from waste may qualify for a tax credit. Renewable resource projects must replace at least 10% of the electricity, gas or oil used. The energy can be used on site or sold.

  Projects that develop new markets for recycled materials or recycle materials not required by law are eligible for the tax credit. Projects that reduce employee commuting (or work-related travel) and investments in alternative fuels may qualify. To date, more than 4,800 energy tax credits have been awarded to Oregon businesses. Altogether, those investments save or generate energy worth some $90 million a year.

- OTEC-Photovoltaic Rebate Program

  Customers of Oregon Trail Electric Cooperative (OTEC) who install grid-connected photovoltaic systems are eligible for a rebate of $600/kW

of installed generation. The rebate, which is available for systems of 25 kW and less, must meet OTEC's net metering and interconnection agreement to be eligible. Customers who choose to net meter will receive a bi-directional meter from OTEC. The installation must be approved by both a state electrical inspector and an OTEC inspector.

The rebate program, which began in 2001, will continue through the end of 2005. So far, the rebate has been used to install a demonstration project at the Grant County Fairgrounds in John Day. OTEC has marketed the rebate with bill stuffers and publicity in the Rural Light magazine.

California

- Solar and Wind Energy System Credit-Corporate

  California's Solar (and Wind) Energy System Credit (SB17x2 Tax Credit) was approved by the Governor on October 8, 2001. The law provides personal and corporate income tax credits for the purchase and installation of solar energy systems, defined as photovoltaic or wind driven systems with a peak generating capacity of up to, but not more than 200 kilowatts. After January 1, 2001and before January 1, 2004, the credit is equal to the lesser of 15% of the cost paid for the purchase and installation of a solar energy system after deducting the value of any municipal, state, or federal sponsored financial incentives, or $4.50 per rated watt of the solar and wind energy system. After January 1, 2004 and before January 1, 2006, a credit of 7.5% of the cost of an installed solar energy system will be available.

  The California Franchise Tax Board (FTB) administers the program in consultation with the California Energy Commission (Commission). The solar or wind system must be certified by the State Energy Resources Conservation and Development Commission. A five-year warranty is required of each system.

- Emerging Renewables Program

  From 1998 through most of 2002, the Emerging Renewables Buydown Program (ERBP), a program of the California Energy Commission, provided rebates for the following types of systems: solar photovoltaic, solar thermal electric, fuel cells using renewable energy, and wind turbines. The ERBP resulted in the installation of over 3,800 new systems capable of producing over 22 megawatts of electricity. The majority of the systems were solar photovoltaic.

  Starting March 3, 2003, the Emerging Renewables Program (ERP) replaces the ERBP. The ERP will provide rebates for the purchase of the same four types of renewable energy generating systems (photovoltaics, small wind turbines, fuel cells using renewable fuels, and solar thermal systems) of 30 kW or less. Future performance incentives will be developed for photovoltaics, solar thermal electric, and fuel cells using a renewable fuel that are => 30 kW and wind turbines => 30 –50 kW.

This rebate is offered to all grid-connected utility customers within the electric utility service area of: Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company. The following system requirements will apply:

-- equipment must be grid connected;

-- electricity production is not to exceed 200% of the site's historical or current electricity needs;

-- the equipment retailer must provide a 5-year warranty;

-- systems/components must meet national standards;

-- only new equipment is eligible;

-- systems must be installed by licensed contractors or owner-installed;

-- all systems must be installed with a performance meter; and

-- system audits will be conducted by the Energy Commission.

Total funding under the program is $118 million.

The initial incentive will be $4.00 for photovoltaic (PV) systems and $2.50 for small wind systems. Incentives will decline by $0.20 per watt every six months, with the first decline beginning July 1, 2003. Additional declines will occur every six months. Owners of self-installed systems will receive a 15% lower rebate than contracted installations.

At this time, the pilot performance-based program for systems 30 kW or greater is not being proposed. The Energy Commission expects to develop this program at a later date. A total of $10 million is reserved for this purpose.

Wind systems less than 30 kW will receive an incentive of $2.50 per watt for the first 7.5 kW. Increments above 7.5 kW will receive an incentive of $1.50 per watt. Rebate payment will be issued following receipt of a signed copy of the utility interconnection applications. A letter of authorization to interconnect with the utility must also be submitted later.

Equipment purchased or installed more than 18 months before applying for a rebate reservation is ineligible. The reservation period for aggregated systems totaling 30 kW or more is 18 months.

No (ERP) rebates are available for systems in publicly owned electric utility service areas. The funds for this program have been returned to the state's general fund as a result of budget cuts.

Ohio

♦ Ethanol Investment Tax Credit-Corporate

In April 2002, Ohio Governor Bob Taft signed into law SB 144, establishing the Ethanol Incentive Board and creating a tax credit against corporation franchise or income tax liability for investments in ethanol

plants whose business plans have been approved by the Board. The law also promulgates that ethanol plants are air quality facilities eligible for Ohio Air Quality Development Authority financing. (However, the law declares that it is not an unfair or deceptive consumer sales practice to fail to disclose a blending of ethanol into gasoline.) In order to be eligible, facilities to be constructed and operated must be majority-owned by Ohio farmers prior to the first day the facility commences production.

This nonrefundable tax credit for personal taxpayers who invest in a certified ethanol plant is available beginning in taxable year 2002 and ending in taxable year 2012. The credit against the personal income tax must be claimed for the taxable year during which the investment was made. The amount of the credit equals 50% of the amount the taxpayer invests in the plant, not to exceed $5,000 per taxpayer per certified ethanol plant (regardless of the number of years in which the taxpayer makes investments).

Any credit amount in excess of the tax due may be carried forward for three tax years, but the amount of the excess credit allowed in any such year must be deducted from the balance carried forward to the next year.

- Conversion Facilities Property Tax Exemption

  This statute exempts certain equipment from property taxation, Ohio's sales and use tax, and Ohio's franchise tax where applicable. Originally enacted in 1978, this incentive has had some impact in the promotion of renewable energy in Ohio, according to the Ohio Office of Energy Efficiency.

  The code applies to tangible property used in energy conversion, thermal efficiency improvements and solid waste energy conversion. Generally, "conversion" refers to the replacement of fossil fuel sources of energy with alternative fuels or technologies; "thermal efficiency improvements" refers to the recovery of waste heat or steam produced in any commercial or industrial processes; and "solid waste conversion" refers to the use of waste to produce energy AND the utilization of such energy. Eligible technologies include solar thermal systems, photovoltaic systems, wind, biomass, and waste recovery systems.

  Upon receipt of certification from the tax commissioner, such property is exempt from Ohio's sales and use taxes. In addition, such equipment improvements cannot be considered an improvement on land for purposes of property taxation, and they are not considered in the assessment of Ohio's franchise tax.

North Carolina

The State Energy Office has a number of projects to market and promote energy efficiency to corporations located in North Carolina. Topics include technical training in energy management and sustainability, including reuse and recycling. Six programs aimed primarily at Industries in North Carolina are described below:

- *Alternative Cooling Technologies* -- Educates industries about the benefits of evaporative cooling, desiccant dehumidification and absorption, and gas-fired chillers.

- *Boiler Efficiency Technical Assistance (statewide)* - Conducts boiler surveys in plants to identify needed improvements. Trains plant personnel on how to solve boiler efficiency problems and promotes state-of-the-art equipment to maintain optimum boiler efficiency.

- *Energy Management Program (statewide)* - Will survey HVAC, lighting, chiller and cooling towers, and compressed air systems for the industrial sector. Follow-up workshops will provide basic and advanced training for facilities including the Certified Energy Manager's Program, and preventive maintenance.

- *Energy Reduction through Industrial Partnerships (statewide)* - Identifies opportunities for industrial facilities to save energy by identifying and establishing partnerships for the reuse of materials, water, and energy.

- *North Carolina Climate Wise/Energy Star for Industry (statewide)* - Markets environmentally sound energy efficient programs to corporations and industry. Assists in developing inventory and pollution mitigation strategies to reduce greenhouse gases in the manufacturing process.

- *North Carolina Industries of the Future (statewide)* - Introduces, promotes, and provides methodology for industries, such as wood products, mining, and chemicals to enhance their competitiveness through improved energy and environmental performance.

To simplify and modernize the North Carolina tax credits for solar and other renewable energy sources, new legislation was enacted in the 1999 legislative session. Fourteen different credits were eliminated and replaced by one general credit that covered residential and non-residential solar and other renewable energy property. A credit of 35% to $250,000 per installation was established for non-residential property for Biomass, Wind, Hydroelectric, and Solar Energy Equipment for: Domestic Water Heating, Active Space Heating, Combined Active Space and domestic Hot Water Systems, Daylighting, and Solar Electric or other Solar Thermal Applications.

In addition to the 35% corporate tax credit for renewable energy installations, North Carolina offers a corporate income tax credit to manufacturers of renewable energy products and equipment. The credit is equal to 25% of the installation and equipment costs of construction with no maximum limit to the credit except that it cannot exceed a taxpayer's tax liability in one year.

From an electricity consumption standpoint, the most intensive end uses are lighting, heating, cooling, process heat, and boiler operation. Therefore, many of the initiatives proposed for the commercial sector are also proposed here.

With respect to lighting, enforcement and expansion of energy code compliance standards should be aggressively pursued. Also, rebates should be offered for the installation of efficient fixtures and bulbs. The rebates for fixtures should be more generous than those for bulbs as once the fixtures are in place, the market will be driven to purchase more efficient bulbs. Industrial lighting programs in Massachusetts have been very instrumental in reducing lighting consumption. Penetration rate studies and Delphi surveys should be conducted in North Carolina to evaluate the potential effectiveness of lighting rebate programs.

Space cooling initiatives should be promoted through performance contracting. Industrial building owners are very savvy with regard to energy efficiency investments and will be quite responsive to performance contracting arrangements. This has been the case in Massachusetts.

With regard to process heat and boiler fuel operation, industrial building owners need to be motivated to install energy efficient equipment. This can be accomplished by offering rebates and direct subsidies.

Global Insight believes that in the absence of the initiatives discussed above, industrial energy consumption is expected to grow on average by 0.6% per year between 2000 and 2020. Based upon experience with these programs in Massachusetts, industrial energy consumption could be reduced to the 0.2% to the 0.4% per year range if the above-mentioned initiatives are fully funded. This was the experience in Massachusetts in the late 1990s.

Transportation Sector

Transportation in North Carolina uses more energy than any other sector. The Energy Policy Working Group feels that key measures for the transportation sector are to increase efficiency, reduce vehicle miles traveled, expand rapid transit use, and increase the use of alternative fuels. In Global Insight's view, the following initiatives show the greatest promise for energy savings in the transportation sector:

- Create financial incentives, such as tax credits, and increase publicity for employer participation in *mass transit use*.
- Develop a competitive grant program for communities, towns, counties, and cities that develop community redesign projects that incorporate *Smart Growth* planning concepts.
- Develop a financial incentive program for *alternative fueled vehicles* and highly efficient vehicles, such as a $250 to $500 payment per new vehicle for

company fleets of four or more whose conventional motor fuel use declines over 20%.

- Develop policies that provide similar incentive payments to automotive retailers for each vehicle sold that either relies on *alternative fuels or whose efficiency is greater than 45 miles per gallon.*

In 2001, it was estimated that North Carolina's transportation sector accounted for approximately 44% of total energy use in the state. From 1995 to 1999, transportation energy consumption grew 3.42% per year, while overall energy consumption in all sectors increased only 1.9% annually. Thus, growth in energy consumption for the transportation sector has been outpacing energy consumption in the state.

The following factors affect energy use in the transportation sector:

- Number of drivers. North Carolina has consistently ranked second over the past 50 years in the number of drivers in the Southeast.

- Amount of VMT ("Vehicle Miles Traveled" in a personal automobile) per driver between 1980 and 1995. North Carolina consistently ranked fourth in the southeast behind Florida, Georgia, and Virginia, in total VMT on urban roadways. With regard to rural VMT, North Carolina is ranked first by current estimates.

- Vehicular efficiency in miles per gallon (MPG). Improvements in vehicle efficiency are essential if energy use in the transportation sector is to be reduced. Although the state of North Carolina could mandate increased fuel efficiency, a more realistic scenario would be to advocate a national fuel efficiency standard.

- Level of maintenance of the vehicle. This will affect its MPG. Establishing aggressive maintenance standards for vehicles is a very effective method for improving fuel efficiency.

- Average length of freight transport trip. Reducing the average length of freight transport trips can be accomplished by highway improvements.

In order to substantially reduce energy consumption in the transportation sector, a number of initiatives need to be pursued. The most effective initiatives will focus upon reducing the number of vehicles on the road, reducing the number of trips each vehicle makes, increasing the fuel efficiency of each vehicle, and increasing the use of alternative fueled vehicles.

Reducing the number of vehicles on the road can be achieved by promoting telecommuting and the use of mass transit. *Granting tax credits to businesses that achieve a certain level of telecommuting and offering direct subsidies to*

commuters who use mass transit are promising policy initiatives that should be implemented.

Reducing the number of trips each vehicle makes can be achieved by raising the gasoline tax and by promoting Smart Growth Communities. *Raising the gasoline tax will cause drivers to plan their trips more carefully so as to reduce their gasoline bills. Smart Growth communities will minimize vehicle trips by encouraging shorter shopping trips, increased pedestrianism and increased mass transit use.*

Increased fuel efficiency is best achieved by promoting a national fuel efficiency standard. Development of stringent Corporate Average Fuel Economy (CAFÉ) standards is the most promising initiative to achieve this. CAFÉ standards have increasingly become a target within the Congress. The passenger car standard, currently at 27.5 mpg, has not been increased since the 1986 model year. The light truck standard is set annually. It currently has a 20.7 mpg CAFÉ standard. Recently, the Bush administration finalized a rulemaking to gradually increase CAFÉ standards for light trucks to 22.2 mpg by model year 2007.

These initiatives should be supplemented by a policy that encourages the increased use of Alternative Fueled Vehicles (AFVs). Alternative Fueled Vehicles, known as AFVs, use fuels such as CNG, propane, electricity or ethanol. Alternative fuels derived from agricultural biomass sources are the most commonly used fuels today. Because the fuel sources come from the domestic agriculture industry, they have advantages in terms of national security, as well as in the development of national and state economies.

Alternative Fuels most commonly used in transportation include:

- Biodiesel – contains no petroleum, and is produced from domestic sources such as vegetable oil and recycled (non-petroleum) greases. It may be used in a 20% blend with petroleum diesel (B20) in unmodified engines, and can be used unblended in appropriately modified engines;
- Liquefied Petroleum Gas (LPG) – composed of 95% propane and 5% butane;
- Natural Gas – produced in liquid and compressed form, this fuel generates low CO and VOC (volatile organic compound) emissions;
- Ethanol – grain alcohol made from corn, sugarcane, and biomass. Ethanol can be blended in a 10% mixture (E10) or even higher mixtures, such as 85% (E85) in appropriately modified engines.
- Tax credits and direct subsidies should be granted for the purchase of alternative fueled vehicles.

Global Insight believes that in the absence of the initiatives discussed above, vehicle miles traveled are expected to increase on average by 2.2% per year between 2000 and 2020, vehicle efficiency (miles per gallon) by 2.3% per year, and on-road per person use by 0.9%. It is Global Insight's assessment that if the

above initiatives are funded, then the growth in vehicle miles traveled can be reduced by 0.2% to 0.4% per year, vehicle efficiency can be reduced by 0.3% to 0.6% per year, and on-road per person use by 0.1% to 0.3% per year.

Renewable Energy Sources

North Carolina has been very active in developing renewable energy policies and programs. The state has important solar, wind, waste, agricultural, hydro, and other renewable energy sources. In Global Insight's view, the following initiatives should be implemented to maximize the supply of renewable energy resources:

- Evaluate the *Renewable Energy Tax Credits* currently in place in North Carolina to assess effectiveness and recommend improvements to increase utilization, in particular for solar water heating, passive solar designs, daylighting, and other solar thermal technologies.

- Implement a *Net Metering* standard that allows customers with renewable electricity systems to receive retail rates when exchanging electricity with the electric utility. The ruling would include an upper limit on the amount of renewable electricity that electric utilities would have to purchase using net metering. Approve interconnection standards and requirements for distributed generation sources tying into the utility grid.

- Institute a *Renewable Portfolio Standard (RPS)* to complement the *NC GreenPower* program and foster the development of a renewable electricity market. The RPS would require that all electric utilities increase the percentage of total distributed electricity that comes from renewable sources, such as hydroelectric, wind, solar, waste-derived fuels, and agricultural fuels.

- Provide matching grants to support the development of the most promising alternative fuels pilot projects, such as landfill methane gas recovery, ethanol and biodiesel production, agricultural and animal waste-to-energy facilities, and cofiring of agricultural and waste products in electric generating plants.

- Develop incentives for the use of alternative fuels, such as reduced taxes, direct payments per gallon purchased, or tax credits.

In 1999, North Carolina's electricity generation was composed primarily of coal-fired power plants (60% of total generation) and nuclear power (36% of total generation).

The majority of the remaining power was generated by hydro (2.5%) and natural gas (1.0%). However, North Carolina's energy situation is currently heavily reliant upon fossil fuels, which are finite, nonrenewable sources of energy. Renewable energy sources provide a very attractive alternative to fossil fuels as a reliable energy supply. The following are some of the most promising technologies:

- **Solar energy** (including photovoltaics technologies that use radiant energy from the sun, solar thermal technologies that use heat energy from the sun, and daylighting which optimizes the use of natural light) -- The National Center for Photovoltaics estimates that the domestic photovoltaic industry will provide up to 15% of new U.S. electricity generating capacity in 2020 and 25% in 2030. *This technology should continue to be promoted with the current 35% tax credit at the state level.*

- **Wind energy** -- Since 1995, the wind power industry has seen average annual growth rates of 30%. Global capacity is currently in the vicinity of 30,000 MW. The largest wind machines being tested are now rated at 2 MW, enough electricity to supply more than 500 average homes with electricity. The most significant barrier to the expansion of wind power in North Carolina is the ability to site wind machines in areas with the greatest wind resources - the high ridges in Western North Carolina and coastal areas. These areas are protected by the Mountain Ridge Protection Act of 1983. *To promote the expansion of this very promising renewable energy source, two initiatives should be pursued. First, the restrictions imposed by the Mountain Ridge Protection Act of 1983 should be loosened. Secondly, the 35% tax credit at the state level for renewable energy systems should be publicized more broadly.*

- **Waste-derived power** (including municipal solid waste, landfill gas, agricultural and animal waste, and industrial and construction waste) -- It is estimated that almost 16 billion kWh of electricity could be generated using renewable biomass fuels in North Carolina. This is enough electricity to supply the annual needs of 1.6 million average homes or almost 39% of residential electricity use in North Carolina. The greatest obstacle to the use of biomass power in North Carolina is the absence of a supply infrastructure. This infrastructure must be developed in order to expand the use of biomass power. Currently, biomass plants receive a 35% credit up to a maximum of $250/kw for commercial installations. *It is recommended that the existing tax credit program for the development of biomass facilities be publicized more broadly.*

- **Water-derived power** (including hydroelectric, tidal, and ocean thermal gradient-derived electricity) -- Currently, 12% of United States energy needs are met with hydropower. This is composed of 80,000 MW of conventional capacity and 18,000 MW of pumped storage. Hydropower represents the primary renewable energy supply from utilities in North Carolina. In 1999, hydroelectric plants supplied over 3.5 million MW's of electricity - about 2.5% of total state electricity sales. It is by far the most economic source of electricity generation at less than $0.025 per kWh. *Global Insight recommends that hydroelectric projects be continually supported and encouraged through appropriate financial incentives.*

- **Fuel Cells** -- Fuel cells are still a developing technology but they possess a very strong potential. As their life cycle cost becomes more attractive, they should be pursued as an important energy generation source. *Global Insight suggests that a 35% tax credit be offered for the development and installation of fuel cell systems.*

- **Agricultural energy sources** (including crops burned directly as a source of energy and crops converted into another fuel source such as ethanol) -- Agriculture is a very important part of North Carolina's economy. *The use of agricultural crops as an energy source either directly or by conversion into ethanol should be pursued aggressively. A 35% tax credit should be offered to encourage the use of agricultural crops as an energy source.*

Net Metering

Net metering allows a producer of energy to receive full retail value for any self-generation that offsets consumption. The main advantage for the customer is that generation can be banked to the grid to offset consumption at a later time, not just at the time of demand. This is especially attractive for intermittent renewable technologies and allows a larger portion of the customer generated electricity to receive full price.

Currently, 37 states and the District of Columbia have implemented some type of net metering program. They are as follows: Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Montana, Nevada, New Hampshire, New Jersey, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Utah, Vermont, Virginia, Washington, Wisconsin, and Wyoming. Net Metering programs can designate all or just specified renewable technologies as eligible. Many net metering programs establish net metering caps to mitigate revenue loss to utilities. For example, Illinois limits net metering to 0.1% of annual peak demand, Ohio to 1.0% of aggregate customer demand, and New York to 0.1% of 1996 peak demand.

The North Carolina net metering bill, S849, died in committee. It contained a 1% peak demand capacity cap.

Global Insight recommends that a net metering standard with a maximum limit of 1% of peak electricity demand be established.

Green Power Pricing

North Carolina is the first state to develop a statewide, voluntary Green Power program – called *GreenPower* -- involving all electricity providers in a regulated market. Presently, all investor-owned utilities have committed to a tariff, and public power and municipalities have agreed to participate. The goal of *NC*

GreenPower is to maximize customer participation and total investment in renewable sources of energy. By offsetting the additional costs associated with renewable electricity generation, *NC GreenPower* hopes to create a viable Green Power market within the state of North Carolina. *NC GreenPower* includes generation from solar, wind, small hydro, and biomass (landfill methane, agricultural, animal, and wood waste). The current plan requires that all generation must be newly developed with the exception of small hydro.

The success of the Green Power pricing program will greatly depend upon the success achieved in convincing electricity consumers about how power is generated and the environmental impacts of the different methods of power generation. Therefore, a very aggressive marketing and education campaign needs to be undertaken.

Global Insight recommends that by 2010, 10% of electricity production in North Carolina should come from green power.

Renewable Portfolio Standard

In order to maximize the true potential for renewable energy sources, it is necessary to develop a renewable portfolio standard. Under a renewable portfolio standard, the market is required to deliver a minimum percentage of its production from specified fuels or technologies. Currently 13 states have implemented a renewable portfolio standard. These states include: Nevada, California, Arizona, New Mexico, Minnesota, Wisconsin, Iowa, Maine, Massachusetts Connecticut, New Jersey, Pennsylvania, and Texas. Current state renewable portfolio standard laws will provide for over 12,400 MW of new renewable power by 2012.

Texas has experienced considerable success with its Renewable Portfolio Standard. Currently, Texas receives slightly more than 1000 MW of electricity from renewable energy sources. The state projects to obtain over 2500 MW of its electricity from renewable energy sources by 2009. Much of the success in expanding the use of renewable energy resources is attributable to the state's plentiful wind resources. Currently, wind power accounts for more than 50% of Texas renewable energy supplies. Since North Carolina and Texas have similar renewable energy sources, successful implementation of the program bodes well for North Carolina.

In addition to spawning a renewable energy market, the Renewable Portfolio Standard would provide job diversification and development. Jobs related to the renewable energy market would include: project development, installation, servicing, operations and maintenance, and local manufacturing.

Global Insight recommends that the state of North Carolina develop a Renewable Portfolio Standard by the end of 2010 whereby at least 10% of energy produced is obtained from green power.

Education and Research

North Carolina's educational systems need to inform students of all ages of the importance of energy to the state's economy, environment, and society. In Global Insight's view, the following initiatives should be implemented to maximize the success of the State Energy Plan:

- Develop and implement energy-related curricula and training for K-12 schools.
- Provide post-secondary school energy-related training for the general public, contractors and subcontractors involved in energy-related fields, those involved in transportation and community planning, managers of vehicles fleets, building managers, developers, realtors, members of the financial community, and others interested in general and technical aspects of energy.
- Design and construct energy-related projects that are integrated into schools of all types. Use these facilities in energy-related educational programs and courses. Design and help fund energy demonstration centers in schools, universities and other public sites throughout the state.

The state's educational system can play two very important roles in ensuring the success of the State Energy Plan. First, it can inform all of North Carolina's citizens of the importance of a reliable energy supply. Secondly, it can provide training to all the key energy players as to how they can make their energy use more efficient.

Two examples of educational programs that accomplish these objectives are the National Energy Education Development (NEED) and Rebuild America programs.

The NEED Project is a nonprofit education association that has focused on teaching students and teachers about energy. NEED designs and distributes hands-on, science based educational materials on energy for grades K-12, conducts student and teacher training conferences, provides evaluation tools, and offers a Youth Awards Program for Energy Achievement. NEED materials are designed to meet the National Science Education Content Standards, as well as many state standards of learning.

At the federal government level, the U.S. Department of Energy manages the EnergySmart Schools program. EnergySmart Schools was founded in 1998. It is managed by DOE's Office of Building Technology, State and Community Programs, and operated through the Rebuild America program, Rebuild America. Rebuild America helps schools and other building operators create local partnerships to plan and implement cost-saving building improvements using energy efficiency and renewable energy. In February 2001, the program unveiled its first in a series of design guidelines for all climates including mild, hot and humid regions.

Global Insight strongly recommends that energy topics be directly incorporated into the school curriculum. This is a very cost effective way of educating the general public concerning energy awareness and providing vocational training on new energy saving technologies and renewable energy sources.

North Carolina has a number of institutions engaged in research on energy efficiency, renewable energy technologies, alternative fuels, transportation planning, and energy supply options. In order to expand energy-related research in the state, the following initiatives should be pursued:

- Establish a formal research program for institutions and organizations engaged in energy research that focuses on key energy topics: renewable energy and energy efficiency improvements; new, more efficient industrial processes; job creation and retention in energy industries; building systems, such as roof systems that integrate power production, moisture control, advanced fuel cells; fuel cells that use propane for rural areas; land planning and energy use; energy efficient manufactured housing; improving energy decision-making in the marketplace; biogas; mountain and coastal wind generation; distributed generation and grid interconnection studies; embodied energy analysis; agricultural waste; coastal and mountain wind power; daylighting and energy use in buildings; and tidal and wave energy.
- Establish a North Carolina energy policy data and analysis center. The center would develop baseline information on energy consumption by state and local governmental entities. It would also objectively evaluate and analyze the economic, environmental, technical, and societal impact of energy policies.

The table below describes some of the research programs currently being funded by the North Carolina Energy Office.

Programs Funded by the NC Energy Office	
Ethanol from Swine Waste (Wake County)	Investigates the use of gasification technologies to convert swine waste, a major environmental pollutant, into fuel grade ethanol.
Awareness and Marketing (Statewide)	Produces and disseminates information about energy efficiency for consumers, the agricultural community, the commercial/industrial sector, schools and local governments throughout North Carolina. Information is disseminated through various channels including the broadcast media, the Internet, and outreach and educational activities. For example, through the Agency for Public Telecommunications, the State Energy Office has produced television programs on flood recovery, alternative fuel vehicles, the EV Challenge, renewable energy, and residential energy conservation.
National Energy Education Development Program (NEED) (Statewide)	Designs educational activities and materials directed at K-12 public school students to promote an understanding of the economic and environmental trade-offs of energy consumption and production. Program includes up-to-date educational evaluation, recognition of achievement, and professional development for educators.
Renewables in Schools (Statewide)	Seeks to demonstrate renewable energy technologies in K-12 public schools through hands-on applications, classroom activities, and technology demonstrations.
Center for Energy Research and Technology (Statewide)	Supports the activities of the Center for Energy Research and Technology (CERT), an energy education institute at North Carolina A&T State University. Programs focus on energy use and energy efficiency in manufactured housing, solar electricity in public housing, and the development of fuel cells.
High Performance Building Guidelines (Statewide)	Provides training and educational presentations about the High Performance Building Guidelines Program recently developed by Triangle J Council of Governments in an attempt to construct more sustainable buildings. Targets policy-makers, designers and other professionals who design, build and manage public schools, state and local government buildings, and facilities at universities and community colleges.
Local Government Buildings (Statewide)	Provides matching funds for costs associated with increasing the energy efficiency of local government buildings.

NC Energy Code Assessment and Training (Statewide)	Evaluates the effectiveness of North Carolina's residential and commercial building energy codes by assessing energy code development and enforcement in the state. Provides training in energy codes for building inspectors and other professionals.
Boiler Efficiency Technical Assistance (Statewide)	Conducts boiler surveys in industrial plants, universities, and state agencies to identify needed improvements. Trains plant personnel on how to solve boiler efficiency problems and promotes state-of-the-art equipment to maintain optimum boiler efficiency.
Energy Efficiency Program for Nonprofits (Statewide)	Will assist nonprofit agencies in implementing measures to reduce their energy costs, thereby expanding available funds for services and programs.
Sustainable Community Development (Statewide)	Will increase communities' awareness of and commitment to sustainable development with a focus on economic well-being, renewable energy, energy efficiency, environmental health, waste minimization and improvements in quality of life.
Alternative Fuels (Statewide)	Promotes and introduces the use of alternative transportation fuels to the public and private fleet management sectors of North Carolina, including compressed natural gas, propane, ethanol, electricity, hydrogen, and biological materials.
Fuel Cell and Micro Turbines (Eastern North Carolina)	Will investigate the viability of distributed generation technology, generating electricity from fuel cell and micro-turbine technologies using methane gas from animal waste. This technology minimizes energy loss and uses waste heat. An application has been made for Special Projects funding to start a fuel cell demonstration project.
Geothermal Heating and Cooling (Central NC))	Compares the energy used by an advanced geothermal heat pump to a conventional heat pump, installed in adjacent mobile classroom units.
Million Solar Roofs Initiative (Boone, Chapel Hill, Durham, Guilford, Asheville, Charlotte**)**	Promotes use of solar energy technologies at the local level through local steering committees, education, training and demonstrations.
North Carolina Solar Center (Statewide)	Provides support for a center offering a range of comprehensive technical and educational services designed to advance the use of solar technologies. The N.C. Solar Center also demonstrates solar applications at the NCSU Solar House and an adjoining test site.

Source: Energy Policy Working Group Energy Plan (http://www.ncenergy.appstate.edu)

Other Research Efforts

In addition to these programs funded through the SEO, a large scale and innovative research endeavor is underway at the Animal and Poultry Waste Management Center at NC State University, assessing alternative ways of dealing with the state's hog waste problem. Currently, under a settlement with the state's two largest hog producers, Smithfield Farms will commit $15 million for the development of environmentally superior technologies for the management of swine waste and to facilitate the development, testing and evaluation of potential technologies on company-owned farms. Under a similar agreement reached in October 2000, Premium Standard is providing an additional $2.5 million. In both cases, the funding is to be used to develop alternatives to the lagoon and spray field system now used in North Carolina to treat waste from hog farms. While still in its infancy, this research program should be carefully monitored to assess if significant biofuel potential exists.

Global Insight believes that for the State Energy Plan to be truly effective, it must be continuously monitored to assess its effectiveness. This will require continuous research, which is best achieved by the funding of specific research programs. Also, the careful monitoring of the energy savings achieved and the production of energy by renewable sources is essential if the Energy Plan is to be improved over time.

Demand Side Management

Demand side management (DSM) programs emerged in the 1970s in response to the Arab oil embargo and were an attempt to curb the rate of growth in electric consumption. DSM encompasses a wide variety of actions taken by utility companies to modify their customer's energy demand. Typically, these programs are targeted at reducing energy use (e.g., efficient buildings, equipment and processes), redistributing energy demand to spread it more evenly throughout the day (e.g., load shifting, innovative rates), and/or encourage strategic load growth (e.g., electrification programs). Utilities accomplish these goals by using rebates, audits, loans and free installation of energy efficient equipment, as well as other similar strategies.

In the mid-1990s, utility companies began to reduce discretionary spending and to scale back their DSM programs. There were two main driving forces behind utility cutbacks in DSM: (1) the economics changed, i.e. the cost of new gas-fired generation dropped substantially; and (2) the move toward deregulation caused many utilities to enact cost-cutting programs that included DSM programs and staff. According to the American Council for an Energy-Efficient Economy (ACEEE), total state and utility funding for energy efficiency programs in 2003 is estimated to be $1.45 billion, up from $1.1 billion in 2000 - a 32% increase. On the other hand, the federal government is seeking to cut Department of Energy efficiency funding by $36 million, or about 4%, while EPA is planning to cut ENERGY STAR by about $15 million, or 30%. The following table shows U.S. electric utility demand-side management program costs by class of ownership from 1996 through 2000.

U.S. Electric Utility Demand-Side Management Program Costs by Class of Ownership, 1996 through 2000
(Thousand Dollars)

Class of Ownership	1996	1997	1998	1999	2000
Investor-Owned	1,548,510	1,321,194	1,208,940	1,183,440	1,300,287
Publicly Owned	159,849	167,553	117,306	165,063	168,900
Cooperative	92,258	87,889	84,849	64,196	84,814
Federal	101,580	59,384	9,825	10,945	10,900
U.S. Total	**1,902,197**	**1,636,020**	**1,420,920**	**1,423,644**	**1,564,901**

Source: Energy Information Administration, Form EIA-861, "Annual Electric Utility Report."

The following table presents U.S. electric utility demand-side management program energy savings, actual and potential peak load reductions, and costs from 1996 through 2000.

U.S. Electric Utility Demand-Side Management Program Energy Savings, Actual and Potential Peak Load Reductions, and Cost, 1996 Through 2000

Item	1996	1997	1998	1999	2000
Energy Savings (million kilowatthours)	61,842	56,406	49,167	50,563	53,701
Actual Peak Load Reductions	29,893	25,284	27,231	26,455	22,901
Potential Peak Load Reductions (megawatts)	48,344	41,237	41,430	43,570	41,369
Cost (thousand dollars)	1,902,197	1,636,020	1,420,920	1,423,644	1,564,901

Source: Energy Information Administration, Form EIA-861, "Annual Electric Utility Report."

The national decline in DSM programs was mirrored in North Carolina. According to a national study conducted by the American Council for an Energy Efficient Economy, spending (measured as the percentage of revenue) on DSM programs in North Carolina declined from 0.31% in 1993 to 0.14% by 1998, or by over half (Source: www.aceee.org). In terms of energy savings attributed to DSM as a percentage of total sales, North Carolina utilities reported a drop of 1.78% in 1993 to 0.94% in 1998, again nearly one half in five years.

The following table displays the planned DSM Summer peak load reductions reported by the state's IOUs over the next nine years as reported to the NC Utilities Commission. It shows a slight increase for CP&L and a modest decrease for Duke and NC Power. Thus, unless current trends are reversed, demand side management programs will in no way reduce peak power requirements and thus decrease the need for new power plants.

Projected DSM Summer Peak Load Reductions (in MW)

Company	2002	2011
Progress Energy	372	385
Duke	888	826
Dominion NC Power	61	49

Source: North Carolina Public Utilities Commission (http://ncuc.commerce.state.nc.us)

The reduction in effort on Demand Side Management programs is a cause of great concern. While understandable that the state's IOUs would look for ways to reduce their operating costs in anticipation of a restructured electricity market, neglecting the need to promote greater efficiency, load management, and distributed generation is not in the public's interest. Additionally, some of the DSM programs in place from the 1990s simply did not meet minimum cost-effectiveness parameters.

While some of the utilities' DSM programs only reduced demand for electricity and did little to reduce consumption, many other programs targeted both demand and consumption. Programs that reduce consumption, such as lighting retrofit projects in commercial buildings, industrial process changes, or energy efficiency programs for new homes, are cost effective for utility customers. Thus, these DSM programs not only reduced demand, but also provided an important service. In fact, electric utility staff members working on DSM programs have given excellent energy outreach assistance during the 1980 to 1995 period. This service has been reduced substantially in recent years.

Global Insight believes that North Carolina needs to develop a program or set of programs to replace the DSM programs that have been eliminated by the IOUs. Public benefit funds and renewable portfolio standards are examples of what other states have adopted in the face of declining effort in DSM programs. These programs are discussed in detail elsewhere in the plan.

Restructuring

The market for electricity is undergoing a transformation that challenges the traditional understanding of the role that utility companies, state regulatory entities, and national policymakers play in providing reliable and affordable electricity to customers. In order to understand the issues currently confronting the utility companies, regulatory bodies, legislatures, and consumers, it is necessary to review a brief history of electricity's legal and economic environments. (Source: Energy Information Administration, Electricity Prices in a Competitive Environment: Marginal Cost Pricing of Generation Services and Financial Status of Electric Utilities, August, 1997).

> As originally conceived in the early 20th century, the electricity market was considered to be a "natural monopoly" in that the costs and, therefore, the risks associated delivering electricity to the market were such that exclusive franchises were provided to companies to serve specific geographic areas. In 1935, Congress passed the Public Utility Holding Company Act that broke up massive interstate holding companies and codified a regulated market arrangement by restricting the electric power generating business to domestic utilities that built and operated power plants to serve specific geographic markets without competition. In return, states carefully regulated the companies operating within their borders.
>
> During the 1970s, the market conditions within the electric industry changed in response to the 1973 Arab oil embargo, the financial collapse of utility stocks following Consolidated Edison's dividend freeze in 1974, and the instability of the political situation in the Middle East manifest with the Iranian revolution of 1978. In response to these threats to the stability of the electricity market, Congress passed the Public Utilities Regulatory Policies Act of 1978 (PURPA) with the intent of ensuring greater energy security. Its effect was to open the door to competition in the electricity supply market by requiring utility companies to purchase electricity from independent generating facilities (known as qualifying

facilities) that used cogeneration technology or generated less than 50 megawatts using renewable technologies.

In 1992, the Energy Policy Act opened up the wholesale market for energy to non-utility generators of electricity. A new class of electricity suppliers was created – exempt wholesale generators — who where allowed to compete for the right to sell electric power. Further, Congress mandated that utilities provide wholesale power transmission service to third parties at cost-based rates, even if doing so caused them to expand their transmission capacity. The Federal Energy Regulatory Commission (FERC) was given the responsibility for implementing open access to the transmission grid as a way of fostering competition in the electricity wholesale market.

Following the 1992 legislation, FERC Orders 888 and 2000 were issued with the intent of fundamentally transforming the utility industry from a regulated industry to an open marketplace where electricity is generated and sold on the wholesale market much like any other commodity. FERC Order 888 issued in 1996 created an open access policy requirement for all transmission owning entities under its jurisdiction. The Order required transmission owners to provide equal access to all market participants on a first come, first served basis. In order to facilitate this open access rule, FERC required that the vertically integrated utilities (typically IOUs with generation, transmission, and distribution capability) to functionally separate their distribution and transmission units.

In essence, Order 888 shifted the function of the transmission grid from serving the transmission owners' interests (serving their own customers) to creating a common carrier system for electricity that is open to market use – much like natural gas. In that same year, 1996, California and Rhode Island passed landmark legislation to restructure their electric power industries and to give their consumers the right to choose their electricity supplier. Very rapidly, many states followed suit so that, by 1998, 24 states had passed some form of utility restructuring legislation. Then, just as rapidly, the momentum behind restructuring quickly faded primarily due to events unfolding in California over the 2000-2001 period.

Restructuring in North Carolina

North Carolina's response to the restructuring movement of the mid-1990s was the establishment in April 1997 of the Study Commission on the Future of Electric Services in North Carolina. This 30-member body, composed of legislators, industry representatives, utilities, and other stakeholder representatives, was charged with examining the cost and adequacy of electrical service in the state and to explore the implications of restructuring on a host of issues ranging from reliability to environmental implications. In 1998, the Commission contracted with Research Triangle Institute to serve as consultant to the body and to provide in-depth research on a number of complex issues.

Following three years of hearings, the Commission recommended legislation that would, among a number of things, allow fully competitive retail electric service as of January 1, 2006, with retail choice available to up to 50% of each power

supplier's load as of January 1, 2005 and stranded costs recovery for investor owned utilities with a rate freeze effective through December 31, 2004. The events of the summer of 2001 in California have put these plans on hold.

Regional Transmission Organizations

In recent years, there has been great concern over the reliability of the nation's electric delivery system. While some parts of the nation clearly have surplus power, other geographical areas face potential shortages. One way of overcoming this problem is to improve the national transmission system so that power can flow easily form one geographical area to another. This dictates integrating the transmission system more tightly. Regional Transmission Organizations (RTO's) have been proposed as a means of achieving this.

FERC Order 2000 issued in 1999 called for the development of Regional Transmission Organizations that are essentially independent, multistate, transmission-owning entities that would administer the electricity grid within their respective geographic boundaries. FERC has recommended dividing the national transmission grid into four components stratified along regional lines. Although attractive in concept, the proposal has met considerable resistance. The North Carolina Utilities Commission and many southern states opposed the FERC proposal based upon the belief that the southern states have sufficient generating capacity and that the South would be funding improvements in transmission for the West and Northeast. A key underlying issue is federal vs. state control of the transmission system.

Several RTOs have been proposed in the southeastern region, namely GridSouth Transco, Grid Florida, SETrans RTO, and Tennessee Valley Authority. Descriptions of GridSouth Transco, Tennessee Valley Authority, and SETrans RTO are presented below.

GridSouth Transco

Progress Energy (CP&L), Duke Energy and South Carolina Electric and Gas (SCANA) filed a plan with the Federal Energy Regulatory Commission (FERC) on Oct. 16, 2000 to create a single, stand-alone regional transmission organization (RTO) to perform many future electricity transmission operations. However, due to regulatory uncertainties in the RTO arena, in February 2002 the companies withdrew their applications before the Public Service Commission of South Carolina and the North Carolina Utilities Commission to transfer functional control of their electric transmission assets to GridSouth.

After the conclusion of the 2001 FERC mediated discussions about creating a single southeastern RTO, two models emerged: a Collaborative Governance Model and an Independent System Administrator (ISA) Model. The Collaborative Model was developed by GridSouth, GridFlorida, and Entergy,

while the ISA Model was developed by SETrans members (excluding Entergy). The FERC mediator recommended the Collaborative Model.

Based upon the latest indications, GridSouth sponsors Duke Energy, Progress Energy and SCANA will delay filing applications with their state commission and will suspend the GridSouth Implementation project.

Tennessee Valley Authority

Electricity production, transmission, and sale in the Tennessee Valley is dominated by the Tennessee Valley Authority (TVA), a federal power marketing administration with an independent Board of Directors and financing authority. TVA serves the entire state of Tennessee, a significant portion of Mississippi (the northeastern part of the state), parts of Alabama, Georgia, Kentucky, and bits of Virginia (the extreme western part) and North Carolina (just west of the Smokies). TVA produces power that it sells, in turn, to about 200 retail utilities and large industrial or federal customers. Power is sold at cost, without profit. TVA rates were among the lowest in the nation until it launched a major power plant construction effort in the 1970s and 1980s. To protect itself from poaching by utilities on its fringes (i.e. the acquisition of TVA customers by utilities), a sales "fence" was erected around TVA. Competing utilities cannot sell power "inside" the fence and TVA cannot sell outside it. TVA can enter into purchase transactions with surrounding utilities and some utilities can use TVA's transmission system to ship power across the TVA system. Otherwise, commercial power transactions within or across the TVA system are essentially prohibited. The FERC has very limited authority over TVA, and the current "fence" is obviously antithetical to FERC Order 2000. Needless to say, current restrictions on TVA transmission access sharply restrict the development of a power market between the Deep South and the Border states and the Midwest. TVA is currently negotiating with some of the newly forming RTOs. This may result in improved transmission access or even TVA participation in an RTO.

To date, TVA has entered into a joint regional coordination agreement with two large investor-owned utilities in the Southeast, Entergy and Southern Company, for the three parties to work together to develop a seamless market for transmission in the region. Additionally, to broaden the scope of regional coordination, TVA entered into a comparable agreement with one of the nation's largest emerging RTOs, Midwest Independent System Operator (MISO). Similar discussions are ongoing with other emerging RTOs, including GridSouth, regarding the development of coordination agreements for the areas they serve.

TVA is also developing contractual arrangements that will facilitate other public and consumer-owned systems to join in regional solutions to transmission issues, the Public Power Regional Transmission Grid.

The partners in this effort are Associated Electric Cooperative, Inc., Big Rivers Electric Cooperative, Inc., East Kentucky Power Corporation and TVA. The

aggregate of these efforts would create a seamless market for transmission covering a region of the scope envisioned by FERC.

SETrans RTO

Owners of transmission systems across Alabama, Florida, Georgia, Mississippi, and South Carolina have announced the signing of a memorandum of understanding (MOU) to develop a regional transmission organization (RTO) for the Southeast. This memorandum reflects the parties' intent to pursue the development of an RTO covering virtually all of the state of Georgia, most of the state of Alabama, and portions of the states of Florida, Mississippi, and South Carolina. This SeTrans RTO development process would result in an independent, incentive-driven, third party organization that will manage (but not own) the transmission facilities dedicated to the RTO. SeTrans, once approved, would handle the planning and operations of more than 53,000 miles of transmission lines. The structure chosen by the participating transmission owners will involve the hiring of a proven independent operator for the transmission system. The agreements between the operator and transmission owners will provide incentives to the operator to maintain or enhance reliability, minimize the cost of the operation of the system and enhance the efficient use of the system.

Southern Company previously applied to the Federal Energy Regulatory Commission (FERC) to form its own Southeastern RTO. However, FERC rejected its proposal because Southern Company planned to funnel certain rate incentives to companies other than the RTO operator, which violated FERC policy. In addition, it is FERC's general policy to consolidate operating RTOs across the country, and the commission was concerned that Southern Company would remain too autonomous if it was the only utility involved in a transmission entity. FERC advised Southern Company not to re-apply for RTO status until it had explored joining forces with neighboring companies.

Global Insight believes that ultimately, the establishment of Regional Transmission Organizations will depend upon how capacity surplus regions are compensated for their transmission system investments. A study should be conducted to develop an equitable compensation system.

Public Benefits Funds

Public benefits funds can have a significant impact on the consumption and production of electricity. A public benefits fund attempts to address a number of problems that surround the generation, transportation and sale of electricity both at the federal and state levels. A public benefits fund pulls together resources through which states can, in a targeted but flexible fashion, attack pockets of energy waste, seize opportunities to develop renewable energy, improve electric services for low-income customers, and develop mechanisms for providing electricity cleanly and cheaply.

The North Carolina General Assembly has appropriated almost no state resources for public benefit fund issues for at least the last ten years and, because of a lack of matching funds, has missed out on federal funding. Current conditions that warrant the creation of a public benefits fund in North Carolina include:

- Lack of guidance for consumers in identifying ways to save energy.
- Decreases over the past decade in spending on energy efficiency programs.
- A need for more substantive measures to achieve greater energy-efficiency in the electric system.
- Loss of matching opportunities for federal funds.
- Dwindling private dollars that support nearly all current energy efficiency and renewable energy programs.

Global Insight believes that a public benefits fund should be created in North Carolina through the imposition of a non-bypassable charge on electricity entering the transmission grid. The fund would be collected and administered by the State Energy Office. The monies collected in the fund would be used for specific uses to promote public benefits that are not addressed through the interests of power generators, or transmission and distribution facilities.

Twenty-one states now have public benefits programs. The following table describes the status of public benefit programs in these 21 states.

Status of State Electric Industry Restructuring Activity
Public Benefits Programs as of February 2003

Alaska	
Renewables	**8/00:** The U.S. Postal Service (USPS) and the Chugach Electric Association, Alaska's largest electric utility, announced that the nation's largest commercial fuel cell system began generating power at the Anchorage Mail Processing Center. The 1-MW system consists of five fuel cells manufactured by International Fuel Cells. The Chugach Electric Association, Inc. installed and will operate the system for the USPS.
Arizona	
Renewables	**5/00:** The Arizona Corporation Commission (ACC) issued its final rulemaking for the Environmental Portfolio Standard that requires electricity providers to derive 1.1% of their total product from renewable energy sources between 2007 and 2012. Implementation will begin with 0.2% from renewables by January 1, 2001. Fifty percent of their renewable power must be derived from solar-generating facilities.
Other Programs	**1/00:** Tucson Electric Power is offering a new program, "GreenWatts," that allows the customers to purchase blocks of

	20 kWh monthly for a price of $2.00 and additional blocks for $1.50. The power will be generated using landfill gas (methane) from Tucson's Los Reales Landfill in TEP's Irvington Generation Station. The proceeds of the program will be used exclusively to construct, maintain, and operate solar electric generating facilities in Arizona.
Arkansas	
Renewables	**5/01:** The Arkansas Renewable Energy Development Act of 2001 will allow net energy metering in Arkansas beginning October 2001. Facilities must use wind, solar, hydroelectric, geothermal, biomass, or fuel cells and microturbines using renewable energy sources, and not have peak capacities over 25 kW for residential facilities and 100 kW for nonresidential facilities.
California	
Renewables	**9/00:** AB 970, signed into law by the governor on September 6, provides $57.5 million to various state energy and resource agencies to implement cost effective energy efficiency and conservation programs. The Energy Resources Conservation and Development Commission receives $50 million of the allotted funds. **8/00:** Los Angeles Department of Water and Power (DWP) received approval from the Board of Water and Power Commissioners to purchase new renewable wind energy. The new wind energy will go to the DWP's Green Power for a Green L.A. program, which offers green power to all DWP customers. The program is the largest effort of its kind by a local utility, with more than 55,000 participants. **9/99:** The first commercial solar plant is planned to be owned and operated by GPU International in California. Once completed, the 132-kilowatt plant will sell power to Green Mountain.com, a leading brand of "green" electric power. **7/99:** To date, over 90% of customers who switch their electricity providers are receiving green power. The California Public Utilities Commission (CPUC) reports show customer requests for green power are up 90% from earlier in the year. A statewide credit for renewable energy purchases allows green power providers to offer renewable-based electricity at a price below that offered by the three major IOUs. **10/98:** Green Mountain Energy Resources, California's leading retail marketer of "green" energy, announced the ground breaking for 2 new wind turbines, the first renewable generation to be constructed directly as a result of having customers sign up for "green" energy in the competitive California electricity market.

	9/97: SB 90 was enacted to provide administrative guidelines for the renewables program under AB 1890. The California Energy Commission is given authority to administer the funds collected for renewable energy technologies support. **9/96:** California's restructuring legislation, AB1890, provided a new method for funding public interest programs, previously funded by electric utilities via the public goods surcharge. CPUC oversees administration of the public interest funds raised by a charge on customers bills per kilowatthour used (about 3.7 to 4.5 mills per kWh). The CPUC appointed a board, the California Board for Energy Efficiency (CBEE), to develop and oversee energy efficiency programs.
Other Programs	**8/00:** Supermarket chain Safeway announced that all 520 of its California Safeway, Pak 'n Save, Vons and Pavilions stores are participating in an energy conservation program unveiled by the governor and the California Grocers Association (CGA). The program was created to save energy during the current power shortages of this summer. **7/00**: San Diego Gas & Electric requested from the CPUC $16 million over the next 2 years for energy efficiency and low-income customer assistance programs.
Funding Mechanisms	Public Interest Programs are funded with a per kwh charge on customers bills at the rate of about 3.7 to 4.5 mills/kWh, depending on the class rate schedule.
Additional Information	**8/00:** On August 23, President Clinton directed the Dept. of Health and Human Services to release $2.6 million in Low Income Energy Assistance Program (LIHEAP) emergency funds for low-income households in the San Diego area. The funds are intended to help low-income customers who have faced substantially higher electricity rates this summer. President Clinton also directed the Small Business Administration (SBA) to urge its lending partners to use SBA credit programs and technical assistance to help small businesses hurt by high electricity prices. **9/99:** In 1998, $201 million was spent on energy efficiency programs. The 1999 budget was approximately $254 million. Funding is authorized through 2000, at which time the CBEE will review the programs and decide whether additional funding is warranted.
Delaware	
Renewables	**4/99:** Restructuring legislation created a fund for environmental incentive programs for conservation and energy efficiency and for low-income fuel assistance and weatherization programs.

Other Programs	**4/99:** Conectiv & Delaware Electric Cooperative will charge a fee based on 1998 kWh retail sales to fund the $250,000 consumer education program.
Funding Mechanisms	**4/99:** A charge of approximately $0.000178/kWh per month will fund the environmental incentive programs with $1.5 million annually. A charge of about $0.000095/kWh will fund the low-income programs with about $800,000 annually.
District of Columbia	
Other Programs	The Commission approved three Reliability Energy Trust Fund (RETF) programs: low-income aggregation; low-income discounts; and low-income weatherization.
Funding Mechanisms	**12/00:** Order No. 11876 set up the Reliability Energy Trust Fund to pay for low-income, energy efficiency, and renewable energy programs.
Illinois	
Renewables	**9/00:** Chicago Mayor Richard M. Daley has announced that the City of Chicago and 47 other local government bodies plan to buy electric power as a group, requiring that 20% of the purchase (80 MW) come from renewable energy. The City has issued a request for proposals to the 13 licensed power providers in Illinois. This is the first opportunity that government agencies have had to purchase power competitively since Illinois passed its restructuring law. **10/99:** Commonwealth Edison will allocate $250 million to a special find to support environmental initiatives and energy-efficiency programs throughout the state.
Maine	
Renewables	**5/97:** Maine's restructuring legislation contains the nation's most aggressive renewables portfolio, requiring 30% of generation to be from renewable energy sources (including hydroelectric).
Maryland	
Other Programs	The state-mandated universal service program will be funded by a charge on consumers' bills that will raise about $24.4 million during the next three years. Residential consumers will pay about $5 each per year amounting to a share of $9.6 million.
Massachusetts	
Renewables	**1/03:** The Massachusetts Renewable Portfolio Standards takes effect on January 1, 2003. The standards require that all retail electric suppliers obtain at least 1% of their electricity from

	energy generated by renewable resources. **11/97:** House Bill 5117, Massachusetts' restructuring legislation, included a renewable portfolio requirement and established a renewable energy fund, funded via a system benefits charge. The Renewable Energy Trust is being administered by the Massachusetts Technology Collaborative. Funds are used to administer the utility-sponsored DSM programs consistent with the manner in which DSM programs have previously been administered in Massachusetts. Funds will also be used to create initiatives to increase the supply of and demand for renewable energy.
Funding Mechanisms	The renewable benefits fund is funded by a system benefits charge paid by consumers of investor-owned utilities in Massachusetts. Between 1998 and 2003, the charge will raise about $200 million, and about $20 million a year after that.
Michigan	
Funding Mechanisms	**2/02:** The Michigan Public Service Commission (PSC) issued an order authorizing $27.4 million in grants from Low-Income and Energy Efficiency Fund to various organizations. According to the PSC press release, the Fund is administered by the PSC and funded from the "securitization savings that exceeded the amount needed to achieve a 5% rate reduction for residential and business customers." The grants were given to the Family Independence Agency, the Michigan Community Action Agency Association, the Salvation Army, the Heat and Warmth Fund, Newaygo County Community Service, Wayne Metropolitan Community Action Agency, and Leslie Outreach Inc.
Nevada	
Renewables	**11/02:** The Public Utilities Commission of Nevada (PUC) passed a temporary regulation that implements a Renewable Energy Credit (REC) trading program. The program will provide retail energy suppliers in Nevada with an economically efficient means to comply with the State's Renewable Portfolio Standard (RPS). One renewable energy credit will be given for each kilowatt-hour of electricity produced from a renewable energy source. Suppliers will be able to shop for the least costly credits to meet the RPS requirements. **5/01:** The Nevada Legislature passed SB 372, a bill that revises the renewable portfolio standard. SB 372 sets up a tiered renewable energy portfolio standard that increases by 2% every 2 years. Every electricity provider must acquire or generate 5% of its electricity from renewable energy systems in 2003, and 15% by the year 2013. **6/99:** AB 366 provides that the PUC establish portfolio

	standards for renewable energy. The standard will phase-in a requirement (beginning with 0.2% by January 2001 and adding 0.2% biannually) that 1% of energy consumed be from renewable energy resources.
New Hampshire	
Other Programs	**6/98:** House Bill 485 allows customers with 25 kW or less renewable generation to utilize net metering.
New Jersey	
Renewables	**12/02:** Upon receipt of the Davies Associates' report, the New Jersey Board of Public Utilities (BPU) revised the Comprehensive Resource Analysis (CRA) program, established in March 2001. The state's energy utilities administered the CRA program for one year with oversight from the Board. Davies Associates' report analyzed the program's first year progress and issued its recommendation to the Board. After considering the report, the BPU established a 13-member "Clean Energy Council" and "a pilot senior weatherization program starting with Monroe Township." **12/02:** According to a Board of Public Utilities' press release, Governor McGreevey announced at this month's Energy Summit that he will establish a Renewable Energy Task Force to promote the use of renewable energy in New Jersey. The Task Force will report to the Governor no later than March 1, 2003 with recommendations on how to strengthen and expand the renewable energy requirements the state imposes on energy suppliers. **8/00:** The Board of Public Utilities (BPU) delayed a decision on a $130 million program that would increase the number of renewable energy projects in the state. BPU is wary that utilities may seek rate increases to pay for the programs once the rate price cap is lifted in New Jersey in 2003. For now, the BPU has directed the utilities in the state to further research the potential price impact on ratepayers. New Jersey restructuring legislation requires spending $230 million for home weatherization, renewable energy and other programs, and increases spending on new energy conservation programs. Also, generation companies must disclose a set of environmental characteristics, including power plant fuels and emissions.
Funding Mechanisms	**10/00:** The New Jersey restructuring legislation authorizes the Board of Public Utilities to implement details of programs to finance energy efficiency, renewable energy, and energy conservation projects. The financing fund is collected from ratepayers, amounting to $2 to $4 a month on residential bills

	As of October 2000, no decisions had been made due to conflicts among renewable energy advocates, the utilities in the state, and the BPU concerning the creation and administration of the fund.
New Mexico	
Renewables	**12/02:** The New Mexico Public Regulation Commission issued an order to adopt Renewable Energy as a Source of Electricity rule or renewable portfolio standard that takes effect on July 1, 2003. According to the renewable rule, utilities would be required to obtain at least 5% of their generation from renewable energy sources by January 1, 2006. The standard would increase 1% each year until it reaches 10% on January 1, 2011.
Other Programs	**9/99:** The Public Regulation Commission approved rules allowing net metering for homes and businesses. The rules take effect September 30, 1999.
New York	
Renewables	**10/00:** The second wind power plant was officially dedicated in New York. The plant located in Wethersfield in Wyoming County, consists of 10 660 kilowatt wind turbines. **9/00:** PG&E Corporation's National Energy Group has begun commercial operation of the largest wind power plant in the eastern U.S., an 11.5-MW facility in Madison County, New York, near the town of Hamilton. Cost sharing and performance incentives available from the New York State Energy Research and Development Authority (NYSERDA) in recent years have succeeded in attracting at least 30 MW of wind energy generation to western New York (of which the Madison County project is the first.) The NYSERDA funds are from the New York Public Service Commission (PSC) order establishing a system benefits charge (SBC) on electricity sales to support energy conservation and renewable energy.
Other Programs	**8/00:** Con Edison has launched EnergyShare, an energy fund to assist low-income residential customers who are experiencing financial difficulties and possible termination of electrical service. Qualifying homeowners or renters will receive one-time grants of up to $200. The program will be administered by the human services agency HeartShare Human Services of New York. In Opinion 96-12, the PSC directed that a non-bypassable system benefits charge be established to support investments in energy efficiency, research, development and demonstration, low-income programs and environmental monitoring that might not be fully supported in a competitive market.

Funding Mechanisms	**1/01:** The System Benefit Charge that funds Public Benefit Programs is continued and expanded for five years from July 2001 to July 2006. Funding is increased from the original $78.1 million to $150 million. Statewide, about $233 million in SBC funds will be collected through wires charges over the three-year period.
Ohio	
Renewables	Restructuring legislation includes a provision for a $110 million revolving load fund for residential and small commercial energy efficiency and renewable energy projects. Also, electricity marketers must disclose environmental information to consumers.
Other Programs	**9/00:** A $33 million electric choice education campaign was launched by the Public Utilities Commission of Ohio (PUCO), the Ohio Consumers Council, and several utilities. The campaign will include television, radio, billboard, and print advertising, a 12-page consumer guide, a toll-free hotline, and an educational website. **1/00:** The PUCO issued a RFP for its consumer education program. The restructuring law directs the state's IOUs to spend up to $16 million for consumer education during the first year of competition, and up to $17 million during the remainder of the transition period. The consumer education for retail choice program objectives include: raising consumer awareness; generating consumer interest in retail choice; building consumer knowledge; providing accurate information; minimizing confusion; and reaching special interest groups.
Oregon	
Renewables	**8/00:** The largest solar photovoltaic project in the northwestern U.S. was dedicated in Ashland, Oregon. The 25-kilowatt renewable energy project will produce enough energy to fully power the Ashland police station and parts of Southern Oregon University and the Oregon Shakespearean Festival. The project is being funded by the City of Ashland, the Bonneville Power Administration, Avista Energy, the Bonneville Environmental Foundation, Southern Oregon University, the Oregon Shakespearean Festival, and the State of Oregon Office of Energy. **1/00:** The Oregon PUC approved Portland General Electric to offer a choice of renewable energy products to customers. For $5 a month, a customer can purchase a 100 kWh block of "green" energy, either "Clean Wind Power" or "Salmon-Friendly Power." Half of the funds collected from the sale of these products will go directly to new wind facility construction

	or salmon habitat restoration.
Other Programs	**3/02:** Utilities will spend $10 million a year on low-income assistance in their territories. SB 1149 provides for a low-income assistance fund through the 3% public purpose fee each utility collects from its customer. Residential customers will be charged 35 cents a month, and nonresidential customers will be charged .035 cent/kWh for low-income assistance starting March 1, 2002. The Oregon Housing and Community Services Agency will work with community action agencies to distribute the money. **9/99:** Ashland, Oregon's net metering program, "progressive solar panel push," encourages installation of solar panels and the ability to sell excess power back to the local utility.
Funding Mechanisms	**3/02:** As of March 1, 2002, a 3-percent public purpose fee will be added to each customer bill to fund conservation, renewable energy, and low-income assistance programs. **11/01:** The Energy Trust of Oregon's Board of Directors signed the PUC's final grant agreement on November 28, 2001. The Energy Trust of Oregon will administer funds collected for conservation and renewable energy. All customers will be assessed a 3% public benefits charge starting March 1, 2002. **10/00:** The Oregon PUC has approved a plan to establish a non-profit organization to oversee money collected from Portland General Electric and PacifiCorp for conservation and renewable energy projects. The 1999 Oregon restructuring law requires the two utilities to collect a 3-percent public benefits charge from all customers starting October 1, 2001, when competition begins in the state.
Pennsylvania	
Renewables	**9/00:** A $21 million Green Energy Fund was created by the Public Utilities Commission (PUC) to be used for investment in green energy projects such as wind, solar, and biomass. The fund, which currently has $5 million, is expected to grow to more than $20 million over the next six years. The fund was created as part of a negotiated settlement between the PUC and Pennsylvania Power and Light (PPL) in the utility's restructuring case two years ago. Businesses and nonprofit organizations that wish to invest in green energy within PPL's territory may apply for the funds. **1/00:** The Pennsylvania Dept. of General Services agreed with Green Mountain to supply about half a dozen state government offices with electricity generated with renewable energy sources. Part of the electricity will be generated at the 10.4 MW Green Mountain Wind Farm currently under construction in Garrett, Pennsylvania.

	1/00: Currently, six companies are offering Green-e certified electricity in Pennsylvania's retail market.
Other Programs	**7/98:** Pike County Power and Light created a Neighbor Fund, administered by the Salvation Army, that gives grants to customers who cannot pay their bills. The Low income Pilot Program forgives $250 of past due payments "if the customer goes on budget billing and makes timely and full payments." Also, Pike County plans to implement energy conservation measures of $500 per customer.
Texas	
Renewables	**9/00:** Texas' renewables portfolio standard requires that the state's utilities install or contract to buy power from 2,000 MW of renewable generating capacity by January 1, 2009. Cielo Wind Power of Austin, Texas and England-based Renewable Energy Systems are developing a 200 MW wind project in King Mountain, Texas. The 160-turbine project is the largest one in the U.S. In addition, Dallas-based TXU Electric and Gas recently announced that it would purchase electricity from a 160 MW wind farm slated for construction in 2001 by developer FPL Energy LLC. **12/99:** The PUC adopted rules to implement renewable energy generation requirements of Senate Bill 7. The purpose of the rules is to encourage construction of renewable energy projects, reduce air pollution from fossil fuel generation, respond to Texans' willingness to pay more for clean energy, increase the renewable energy supply in Texas, and achieve these goals at a modest cost for Texans. **6/99:** Restructuring legislation provisions state that by January 1, 2009, an additional 2,000 MW of generating capacity from renewable technologies will have been installed.
Other Programs	**1/02:** Under the LITE-UP program, low-income customers can receive a 10% reduction if their income is at or below 125% of federal poverty level guidelines. Customers, who already receive Department of Human Services benefits, automatically qualify. The PUC has set up an electronic enrollment system for them, but customers can call the program administrator or their retail electric provider to confirm their enrollment. Customers should see the reduction on their bills by the end of March. **8/00:** The Texas PUC released its Consumer Education Plan. The 4-year plan designed to prepare residential and small business consumers for retail competition, includes strategies to ensure Texas consumers have the information needed to make decisions about the purchase of electricity. The entire plan over 4 years will cost about $34 million.

Wisconsin	
Renewables	**7/02:** Based on utility service area, eligible Wisconsin consumers may participate in the Focus on Energy program which promotes energy efficiency and renewable energy. The Wisconsin Department of Administration's Division of Energy contracts services from various organizations, the Wisconsin Energy Conservation Corporation (residential and renewable energy programs), the Milwaukee School of Engineering (business and industrial programs), the Energy Center of Wisconsin (environmental research, education and training programs), PA Consulting (independent evaluation), and Hoffman York (program marketing). The Focus on Energy Renewable Energy Program offers financial incentives and grants to residential, commercial and industrial consumers, such as low-interest rate loans, cash-back rewards, a technical feasibility grant, a demonstration grant, a business and marketing grant, and an ad hoc grant.

Source: Database of State Incentives for Renewable Energy (http://www.dsireusa.org/summary tables/financial incentives

A federal public benefits fund is also needed to augment state resources devoted to these public purposes, and to spur the creation of public benefits programs in the more than one-half of the states that do not undertake them now.

The specific public purpose programs funded should include:

- Energy efficiency programs
- Low-income assistance
- Improvement of electric facilities for rural or remote communities
- Greenhouse gas mitigation projects
- New renewable energy capacity or efficiency improvements to existing renewable energy capacity
- Increased efficiency of hydroelectric dams or providing additional capacity at existing dams.

The Alliance to Save Energy estimates that a well-designed federal public benefits fund can displace up to 130,000 MW of electric capacity by the year 2020. This is the equivalent of more than 400 300MW power plants, and nearly one-third of needed capacity increases by 2020 estimated by the Energy Information Administration in 1999.

A public benefits fund has been very successful in funding energy efficiency and renewable energy programs in Massachusetts. Each electricity customer in Massachusetts currently pays a conservation charge of almost three mills per kWh on his electric bill to fund energy efficiency programs in Massachusetts. The

funds raised sponsor a wide array of energy conservation programs, ranging from rebate programs for the purchase of energy efficient fixtures and light bulbs to commercial and industrial programs that encourage energy efficiency in both new and existing buildings.

In addition, electricity customers in Massachusetts pay a 1 mill per kWh charge on their electric bill to fund the development of renewable energy sources. This has led to the development of several solar energy projects in the state as well as the promotion of a number of fuel cell projects.

Power Aggregation

An excellent example of power aggregation in North Carolina is the *North Carolina Electric Membership Corporation* (NCEMC). The NCEMC is an umbrella service organization that acquires the electric power supplies needed by its 27 members, which are distribution cooperatives providing retail electric service to over 750,000 customers in North Carolina.

NCEMC owns a share of the Catawba nuclear power generating station in South Carolina, which can supply approximately 20% of the entire power requirement of the 27 co-ops. NCEMC purchases on the wholesale power market most of its remaining requirement, using short-term and long-term contracts. NCEMC is one of the largest wholesale power buyers in the United States.

There are six distribution cooperatives operating in the state that are not members of NCEMC. Five are incorporated in contiguous states and provide service in limited areas across the border into North Carolina. The sixth is French Broad EMC, which has agreed to provide appropriate information to NCEMC for inclusion in NCEMC's IRP filings.

NCEMC is a member of the Southeastern Electric Reliability Council (SERC), and participates on several committees of reliability councils. NCEMC also participates in and closely monitors activities related to Regional Transmission Organizations (RTOs), and specifically the Alliance RTO and the GridSouth RTO. These two RTOs are being proposed for areas served by NCEMC members. NCEMC reports that these efforts are particularly important to it because of NCEMC's status as a transmission-dependent utility that relies on the transmission systems of Duke, Progress Energy, and NC Power to transfer the power it generates and purchases to the approximately 267 delivery points of its member EMCs.

NCEMC's total load growth in North Carolina is projected to be approximately 3.1% per year during the 2000-2010 summer seasons. To meet this expected growth, NCEMC is relying primarily on firm purchases from Progress Energy, Duke, and NC Power in the near term, but it expects to rely primarily on currently undesignated purchases in the long run. Nevertheless, NCEMC expects a significant portion of its long-term purchases (greater than five years) to be tied to

a distinct capacity resource located within the control areas of its current power suppliers.

ElectriCities is a non-profit government service organization representing cities, towns and universities that own electric distribution systems. Today, ElectriCities represents 98 members in North Carolina, South Carolina and Virginia. There are 75 members in North Carolina.

Formed back in 1965 to protect the interests of public power customers, and to provide a unified voice to speak out in the North Carolina legislature, ElectriCities continues today to serve public power communities.

Most member cities have been in the electric business for 100 years or more. Originally the cities built small hydroelectric generators in their hometowns. In some cases, the municipalities set up their own systems when other power suppliers refused to serve these communities. As their population grew and their generators aged, the cities became wholesale purchasers of electricity from the state's investor-owned utilities (IOUs).

Global Insight believes that power aggregation should be encouraged and facilitated by state programs that tout the leverage that cooperatives can exert in extracting lower prices from electricity suppliers.

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APPENDIX: FORECAST TABLES

North Carolina Economic Outlook

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Population and Labor Force (Thousands)															
Resident Population	6720	7380	8090	8200	8330	8690	9300	9930	10580	1.9	1.9	1.4	1.4	1.3	1.3
Labor Force	3468	3628	3958	3995	4038	4166	4347	4514	4683	0.9	1.8	1.0	0.9	0.8	0.7
Unemployment (%)	4.18	4.32	3.63	5.53	6.43	5.71	4.92	4.51	4.33	0.7	-3.4	9.5	-2.9	-1.7	-0.8
Housing (Thousands)															
Stock	2539	2775	3127	3201	3274	3487	3837	4182	4524	1.8	2.4	2.2	1.9	1.7	1.6
Starts	48	67	82	83	80	81	80	81	81	7.0	4.2	-0.3	-0.3	0.1	0.0
Employment (Thousands)															
Total	3251	3605	4085	4035	4032	4208	4527	4825	5131	2.1	2.5	0.6	1.5	1.3	1.2
Agriculture	134	146	150	131	136	134	135	136	137	1.7	0.6	-2.2	0.2	0.1	0.1
Total Non-farm	3118	3459	3935	3903	3896	4075	4392	4689	4994	2.1	2.6	0.7	1.5	1.3	1.3
Manufacturing	861	864	784	735	704	672	655	646	640	0.1	-1.9	-3.0	-0.5	-0.3	-0.2
Non-manufacturing	2256	2595	3151	3169	3192	3402	3737	4043	4354	2.8	4.0	1.6	1.9	1.6	1.5
Services	592	762	1032	1047	1061	1169	1340	1500	1656	5.2	6.2	2.5	2.8	2.3	2.0
Trade	716	795	893	890	891	921	976	1029	1080	2.1	2.4	0.6	1.2	1.1	1.0
Trans/Comm/Utils.	152	165	182	184	183	199	213	228	243	1.6	2.0	1.7	1.4	1.4	1.3
Fin/Ins/Real Estate	135	145	187	190	189	208	230	253	277	1.4	5.3	2.1	2.1	1.9	1.8
Construction	164	175	229	229	225	232	255	274	294	1.3	5.6	0.2	1.9	1.4	1.4
S&L Govt.	434	489	555	562	576	605	647	684	722	2.4	2.6	1.7	1.3	1.1	1.1
Gross State Product (Output) (Bill. chain wtd 96$)															
Total	163	198	260	266	271	303	370	453	554	4.0	5.5	3.1	4.0	4.1	4.1
Ag/Forestry/Fisheries	4	4	5	5	5	6	7	8	8	1.1	1.9	5.7	2.2	2.2	1.6
Manufacturing	49	56	62	60	59	65	74	82	89	2.9	2.1	0.9	2.5	2.3	1.6
Non-manufacturing															
Services	22	30	43	46	48	58	79	105	137	6.0	7.9	6.1	6.4	5.8	5.6
Trade	25	31	39	40	40	43	51	64	78	4.4	4.7	2.0	3.6	4.5	3.9
Trans/Comm/Utils.	13	16	19	20	20	22	28	35	42	3.2	3.6	3.5	4.8	4.4	3.9
Fin/Ins/Real Estate	21	27	48	50	51	59	72	90	122	5.4	12.3	4.4	4.2	4.5	6.1
Construction	7	8	12	13	13	13	15	17	19	4.2	7.1	1.6	2.5	2.7	2.8
S&L Govt.	15	18	22	23	24	26	31	37	42	3.2	4.9	3.4	3.5	3.2	2.6
Income & Wages (Bill. Of Chained 96$)															
Personal Income	135	161	202	209	213	232	283	346	409	3.6	4.7	2.8	4.0	4.1	3.4
Disp. Income	119	141	173	179	184	202	245	300	355	3.5	4.1	3.2	3.9	4.2	3.4
Disp. Inc./Capita (1)	17.7	19.1	21.3	21.8	22.1	23.2	26.3	30.2	33.5	1.6	2.2	1.7	2.5	2.8	2.1
Wage & Salary Disburse	78	92	119	123	124	136	160	189	214	3.4	5.3	2.6	3.4	3.3	2.5
Manufacturing	23	25	27	27	27	27	29	32	34	1.9	1.9	0.2	1.2	1.8	1.5
Non-manufacturing	52	64	88	92	93	104	126	152	175	4.1	6.7	3.3	4.1	3.8	2.9
Price Deflators															
US PDI (1996=1.0)	0.87	0.98	1.07	1.09	1.11	1.18	1.31	1.48	1.72	2.4	1.8	2.0	2.1	2.5	3.1
US PDI (2001=1.0)	0.80	0.90	0.98	1.00	1.02	1.08	1.20	1.36	1.58	2.4	1.8	2.0	2.1	2.5	3.1
US CPI (1983=1.0)	1.31	1.52	1.72	1.77	1.80	1.93	2.17	2.50	2.95	3.0	2.5	2.3	2.4	2.9	3.4
US CPI (2001=1.0)	0.74	0.86	0.97	1.00	1.02	1.09	1.23	1.41	1.67	3.0	2.5	2.3	2.4	2.9	3.4
Weather Degree Days															
Heating	2657	3609	3670	3086	3402	3402	3402	3402	3402	6.3	0.3	-1.5	0.0	0.0	0.0
Cooling	1532	1452	1347	1385	1418	1418	1418	1418	1418	-1.1	-1.5	1.0	0.0	0.0	0.0

(1) thousand dollars

North Carolina Energy Outlook

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Total Primary Consumption by Fuel (Billion Btu)															
Petroleum	729583	845890	978045	983167	992819	1072741	1189287	1303567	1420409	3.0	2.9	1.9	2.1	1.9	1.7
Natural Gas	167709	216351	236587	207914	218894	266053	290777	323589	349439	5.2	1.8	2.4	1.8	2.2	1.5
Coal	604727	662701	786201	762983	771444	876732	1018915	1137047	1249712	1.8	3.5	2.2	3.1	2.2	1.9
Nuclear	276669	382731	415646	401284	402489	406106	412134	418162	424189	6.7	1.7	-0.5	0.3	0.3	0.3
Hydropower	73496	74750	48829	44974	68499	68889	69566	70277	71025	0.3	-8.2	7.1	0.2	0.2	0.2
Wood	83767	93706	91422	92519	93589	96890	102492	108235	114152	2.3	-0.5	1.2	1.1	1.1	1.1
Solar	403	587	627	635	648	686	747	807	864	7.8	1.3	1.8	1.7	1.5	1.4
Other	16993	18488	13098	14743	14835	15113	15575	16037	16499	1.7	-6.7	2.9	0.6	0.6	0.6
Total	1952944	2294617	2569827	2507583	2562569	2802525	3098746	3376915	3645425	3.3	2.3	1.7	2.0	1.7	1.5
Electricity Sales	306822	357143.44	408592.61	412097.69	412389.28	449621.59	502424.63	552685.85	602256.05	3.1	2.7	1.9	2.2	1.9	1.7
Final Demand															
Residential	210636	264425	292988	287314	300872	322681	358285	393341	427976	4.7	2.1	1.9	2.1	1.9	1.7
Commercial	142872	169210	203648	202426	200611	217670	240005	259828	279205	3.4	3.8	1.3	2.0	1.6	1.4
Industrial (ex. NUG)	406385	463971	442741	425762	415526	455646	489729	518442	540537	2.7	-0.9	0.6	1.5	1.1	0.8
Transportation	539715	607015	714499	732851	752434	816110	921229	1026609	1136694	2.4	3.3	2.7	2.5	2.2	2.1
Total Final Demand	1299609	1504621	1653875	1648353	1669442	1812106	2009248	2198219	2384412	3.0	1.9	1.8	2.1	1.8	1.6
Electricity Transformatic	653335	789997	915952	859230	893126	990419	1089498	1178696	1261013	3.9	3.0	1.6	1.9	1.6	1.4
Total	1952944	2294617	2569827	2507583	2562569	2802525	3098746	3376915	3645425	3.3	2.3	1.7	2.0	1.7	1.5
Energy Efficiency Indicators															
Energy per Person	291	311	318	306	308	322	333	340	345	1.4	0.4	0.3	0.7	0.4	0.3
Energy per GSP96	11978	11566	9890	9427	9459	9237	8379	7459	6579	-0.7	-3.1	-1.4	-1.9	-2.3	-2.5
Energy Prices by Sector															
Residential (2001 Dollars per Million Btu)															
Electricity	28.80	26.46	23.88	24.03	23.53	22.45	21.04	19.42	17.81	-1.7	-2.0	-1.2	-1.3	-1.6	-1.7
Electricity (cts/kwh)	9.83	9.03	8.15	8.20	8.03	7.66	7.18	6.63	6.08	-1.7	-2.0	-1.2	-1.3	-1.6	-1.7
Natural Gas	7.49	7.46	9.46	12.00	9.19	8.40	8.40	8.51	8.35	-0.1	4.9	-2.4	0.0	0.3	-0.4
Petroleum															
Distillate Fuel	9.96	6.98	10.51	9.52	8.70	8.67	8.94	9.41	9.68	-6.8	8.5	-3.8	0.6	1.0	0.6
Liquified Petroleum Ga	14.05	12.67	16.47	14.92	13.63	13.58	14.02	14.74	15.16	-2.0	5.4	-3.8	0.6	1.0	0.6
Average	21.01	18.73	18.61	19.29	18.02	17.23	16.51	15.72	14.83	-2.3	-0.1	-1.5	-0.9	-1.0	-1.2
Commercial (2001 Dollars per Million Btu)															
Electricity	23.72	21.23	19.11	19.05	18.76	17.90	16.78	15.50	14.22	-2.2	-2.1	-1.3	-1.3	-1.6	-1.7
Electricity (cts/kwh)	8.09	7.24	6.52	6.50	6.40	6.11	5.73	5.29	4.85	-2.2	-2.1	-1.3	-1.3	-1.6	-1.7
Natural Gas	5.62	5.64	7.56	9.78	7.02	6.38	6.41	6.54	6.45	0.1	6.0	-3.3	0.1	0.4	-0.3
Petroleum															
Distillate Fuel	6.78	4.75	7.11	6.20	5.47	5.40	5.64	6.06	6.34	-6.9	8.4	-5.3	0.9	1.4	0.9
Residual Fuel Oil	3.96	3.12	4.10	3.54	3.68	3.21	3.36	3.68	3.88	-4.6	5.6	-4.8	0.9	1.8	1.1
Liquified Petroleum Ga	12.14	10.55	16.07	14.00	12.35	12.21	12.76	13.70	14.32	-2.8	8.8	-5.3	0.9	1.4	0.9
Average	17.34	15.78	15.48	16.06	15.12	14.35	13.72	13.00	12.21	-1.9	-0.4	-1.5	-0.9	-1.1	-1.3
Industrial (2001 Dollars per Million Btu)															
Electricity	17.52	15.81	13.73	14.07	13.57	12.97	12.17	11.25	10.32	-2.0	-2.8	-1.1	-1.3	-1.6	-1.7
Electricity (cts/kwh)	5.98	5.39	4.69	4.80	4.63	4.43	4.15	3.84	3.52	-2.0	-2.8	-1.1	-1.3	-1.6	-1.7
Natural Gas	4.21	3.83	5.27	6.31	4.62	4.49	4.55	4.73	4.72	-1.9	6.6	-3.2	0.3	0.8	-0.1
Petroleum															
Distillate Fuel	7.23	5.00	7.29	6.38	5.65	5.59	5.83	6.25	6.52	-7.1	7.8	-5.2	0.9	1.4	0.9
Residual Fuel Oil	3.96	3.12	4.21	3.63	3.79	3.30	3.46	3.78	3.98	-4.6	6.1	-4.7	0.9	1.8	1.1
Liquified Petroleum Ga	12.14	8.90	13.43	11.75	10.40	10.29	10.73	11.51	12.01	-6.0	8.6	-5.2	0.9	1.4	0.9
Coal	2.25	1.91	1.70	1.80	1.98	1.99	1.94	1.91	1.84	-3.3	-2.3	3.3	-0.5	-0.3	-0.7
Average	10.31	8.69	9.10	9.42	8.71	8.30	8.16	8.07	7.86	-3.4	0.9	-1.8	-0.3	-0.2	-0.5
Transportation (2001 Dollars per Million Btu)															
Petroleum															
Diesel, Pump	152.07	121.45	150.60	138.61	126.96	123.84	123.67	125.49	124.89	-4.4	4.4	-3.8	0.0	0.3	-0.1
Motor Gasoline, Pump	146.77	122.73	146.39	136.80	129.87	125.08	127.60	132.07	134.16	-3.5	3.6	-3.1	0.4	0.7	0.3
Wholesale	98.41	69.58	97.74	88.73	79.41	76.87	80.29	86.23	90.13	-6.7	7.0	-4.7	0.9	1.4	0.9
Gas Tax, Federal	11.92	20.47	18.74	18.40	18.07	17.00	15.31	13.55	11.66	11.4	-1.7	-1.9	-2.1	-2.4	-3.0
Gas Tax, State & Loc	26.94	24.02	21.60	24.10	23.67	23.80	24.41	24.62	24.69	-2.3	-2.1	2.0	0.5	0.2	0.1
Dealer Margin	9.50	8.66	8.30	5.57	7.36	7.41	7.60	7.66	7.68	-1.8	-0.8	-2.3	0.5	0.2	0.1
Energy Expenditures (Million Nominal Dollars)															
total	9012	10743	13274	13530	13219	14494	17092	20193	24017	3.6	4.3	1.8	3.4	3.4	3.5
per capita ($)	1341	1456	1641	1650	1587	1668	1838	2034	2270	1.7	2.4	0.3	2.0	2.0	2.2
per house ($)	3550	3872	4245	4227	4038	4157	4455	4829	5309	1.8	1.9	-0.4	1.4	1.6	1.9
Energy Expenditures (Million 2001 Dollars)															
total	11291	11949	13522	13530	12980	13389	14222	14872	15220	1.1	2.5	-0.2	1.2	0.9	0.5
per capita ($)	1680	1619	1671	1650	1558	1541	1529	1498	1439	-0.7	0.6	-1.6	-0.1	-0.4	-0.8
per house ($)	4448	4307	4324	4227	3965	3840	3707	3556	3364	-0.6	0.1	-2.3	-0.7	-0.8	-1.1

North Carolina Emission Outlook

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Carbon Emission, All Sectors (Million Metric Tons)															
Natural Gas	2.43	3.13	3.42	3.01	3.17	3.85	4.21	4.68	5.06	5.2	1.8	2.4	1.8	2.2	1.5
Petroleum	14.39	16.68	19.29	19.39	19.58	21.15	23.45	25.71	28.01	3.0	2.9	1.9	2.1	1.9	1.7
Coal	16.85	18.47	21.91	21.26	21.50	24.43	28.40	31.69	34.83	1.8	3.5	2.2	3.1	2.2	1.9
Sulfur Dioxide Emission, Power Sector															
Sulfur Dioxide (Thousand Short Tons)															
Natural Gas	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Petroleum	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Coal	374	378	481	447	432	425	363	212	233	0.2	4.9	-2.4	-3.1	-10.3	1.9
Sulfur Dioxide (Pounds per million Btu)															
Natural Gas	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Petroleum	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Coal	1.42	1.27	1.30	1.24	1.19	1.02	0.75	0.39	0.39	-2.2	0.5	-4.6	-6.1	-12.3	0.0
Nitrogen Oxides Emission, Power Sector															
Nitrogen Oxides (Thousand Short Tons)															
Natural Gas	0	0	0	0	0.00	0.24	0.26	0.39	0.50	--	--	--	1.5	8.7	5.2
Petroleum	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Coal	192.08	190.56	197.16	178.32	167.13	145.84	82.37	81.35	89.59	-0.2	0.7	-5.9	-10.8	-0.3	1.9
Nitrogen Oxides (Pounds per million Btu)															
Natural Gas	0	0	0	0	0.02	0.02	0.02	0.02	0.02	--	--	--	0.0	0.0	0.0
Petroleum	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Coal	0.73	0.64	0.53	0.50	0.46	0.35	0.17	0.15	0.15	-2.6	-3.6	-8.0	-13.5	-2.5	0.0
NOx Emission, On-Highway *		781.11	789.06	757.25	725.44	630.00	458.01	277.39	150.40	--	0.2	-4.4	-6.2	-9.5	-11.5
VOC Emission, On-Highway *		372.88	388.02	379.32	370.62	344.52	313.04	289.58	267.22	--	0.8	-2.4	-1.9	-1.5	-1.6

* Source: Data for year 1995, 1997, 2007, 2015 from NC Division of Air Quality

North Carolina Energy Outlook

Residential Sector

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Consumption (Billion Btu)															
Electricity	113087	134795	156256	159006	163986	176353	196502	216327	235927	3.6	3.0	2.4	2.2	1.9	1.7
Natural Gas	36122	51009	65558	58739	64014	69326	77960	86447	94841	7.1	5.1	1.1	2.4	2.1	1.9
Petroleum	44202	55775	55551	53635	56610	59784	65068	70325	75530	4.8	-0.1	1.5	1.7	1.6	1.4
Distillate Fuel	20715	22687	17983	17161	17983	18315	19021	19828	20683	1.8	-4.5	0.4	0.8	0.8	0.8
Kerosene	7983	11894	11220	11428	11629	12201	13093	13918	14683	8.3	-1.2	1.7	1.4	1.2	1.1
Liquified Petroleum G	15505	21194	26349	25046	26998	29267	32954	36579	40164	6.5	4.5	2.1	2.4	2.1	1.9
Coal	1378	1970	969	969	989	1047	1141	1231	1318	7.4	-13.2	1.6	1.7	1.5	1.4
Wood	15443	20289	14027	14330	14626	15485	16868	18204	19496	5.6	-7.1	2.0	1.7	1.5	1.4
Solar	403	587	627	635	648	686	747	807	864	7.8	1.3	1.8	1.7	1.5	1.4
Total	210636	264425	292988	287314	300872	322681	358285	393341	427976	4.7	2.1	1.9	2.1	1.9	1.7
Energy Efficiency Indicators															
Res per Person	31.3	35.8	36.2	35.0	36.1	37.1	38.5	39.6	40.5	2.7	0.2	0.5	0.7	0.6	0.4
Res per House	83.0	95.3	93.7	89.8	91.9	92.5	93.4	94.1	94.6	2.8	-0.3	-0.2	0.2	0.1	0.1
Prices (Nominal Dollars per million Btu)															
Electricity	22.99	23.79	23.45	24.03	23.96	24.30	25.28	26.37	28.10	0.7	-0.3	0.7	0.8	0.8	1.3
Electricity (cts/kwh)	7.84	8.12	8.00	8.20	8.18	8.29	8.63	9.00	9.59	0.7	-0.3	0.7	0.8	0.8	1.3
Natural Gas	5.98	6.71	9.29	12.00	9.36	9.09	10.10	11.55	13.18	2.3	6.7	-0.4	2.1	2.7	2.7
Petroleum															
Distillate Fuel	7.95	6.28	10.32	9.52	8.86	9.38	10.75	12.77	15.27	-4.6	10.4	-1.9	2.8	3.5	3.6
Liquified Petroleum Ga	11.22	11.39	16.17	14.92	13.88	14.70	16.85	20.01	23.93	0.3	7.3	-1.9	2.8	3.5	3.6
Average	16.77	16.84	18.26	19.29	18.35	18.65	19.84	21.35	23.40	0.1	1.6	0.4	1.2	1.5	1.9
Prices (2001 Dollars per million Btu)															
Electricity	28.80	26.46	23.88	24.03	23.53	22.45	21.04	19.42	17.81	-1.7	-2.0	-1.2	-1.3	-1.6	-1.7
Electricity (cts/kwh)	9.83	9.03	8.15	8.20	8.03	7.66	7.18	6.63	6.08	-1.7	-2.0	-1.2	-1.3	-1.6	-1.7
Natural Gas	7.49	7.46	9.46	12.00	9.19	8.40	8.40	8.51	8.35	-0.1	4.9	-2.4	0.0	0.3	-0.4
Petroleum															
Distillate Fuel	9.96	6.98	10.51	9.52	8.70	8.67	8.94	9.41	9.68	-6.8	8.5	-3.8	0.6	1.0	0.6
Liquified Petroleum Ga	14.05	12.67	16.47	14.92	13.63	13.58	14.02	14.74	15.16	-2.0	5.4	-3.8	0.6	1.0	0.6
Average	21.01	18.73	18.61	19.29	18.02	17.23	16.51	15.72	14.83	-2.3	-0.1	-1.5	-0.9	-1.0	-1.2
Energy Expenditures (Thousand Nominal Dollars)															
total	3532331.4	4453736.1	5351097.8	5540869.9	5522264.5	6018740.8	7107770	8398292	10016259	4.7	3.7	2.4	3.4	3.4	3.6
per capita ($)	526	603	661	676	663	693	764	846	947	2.8	1.9	0.9	2.0	2.0	2.3
per house ($)	1391	1605	1711	1731	1687	1726	1853	2008	2214	2.9	1.3	0.2	1.4	1.6	2.0
Energy Expenditures (Thousand 2001 Dollars)															
total	4425565	4953645	5451118	5540870	5422764	5559684	5914099	6185229	6347513	2.3	1.9	0.4	1.2	0.9	0.5
per capita ($)	659	671	674	676	651	640	636	623	600	0.4	0.1	-1.0	-0.1	-0.4	-0.7
per house ($)	1743	1785	1743	1731	1656	1594	1542	1479	1403	0.5	-0.5	-1.8	-0.7	-0.8	-1.0

North Carolina Energy Outlook

Commercial Sector

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Consumption (Billion Btu)															
Electricity	87060	106125	133330	137810	135219	145919	163161	179207	195770	4.0	4.7	1.8	2.3	1.9	1.8
Natural Gas	32277	38595	44226	39557	40580	45619	49967	53355	55925	3.6	2.8	0.6	1.8	1.3	0.9
Petroleum	19994	19298	22599	21560	21294	22404	22824	22924	22880	-0.7	3.2	-0.2	0.4	0.1	0.0
Liquified Petroleum G	2736	3740	4752	4268	4579	4878	5351	5784	6225	6.5	4.9	0.5	1.9	1.6	1.5
Gasoline	4105	317	712	1583	997	1023	1069	1113	1160	-40.1	17.5	7.5	0.9	0.8	0.8
Distillate Fuel	11288	13224	14912	13729	13612	14353	14278	13941	13451	3.2	2.4	-0.8	-0.1	-0.5	-0.7
Kerosene	443	834	1326	1221	1210	1276	1269	1239	1196	13.5	9.7	-0.8	-0.1	-0.5	-0.7
Residual Fuel Oil	1421	1182	898	759	895	874	857	847	848	-3.6	-5.4	-0.5	-0.4	-0.2	0.0
Coal	2560	3659	1800	1800	1809	1917	2084	2233	2381	7.4	-13.2	1.3	1.7	1.4	1.3
Wood	982	1532	1694	1700	1709	1811	1969	2109	2249	9.3	2.0	1.3	1.7	1.4	1.3
Total	142872	169210	203648	202426	200611	217670	240005	259828	279205	3.4	3.8	1.3	2.0	1.6	1.4
Energy Efficiency Indicators															
Com per Person	21.3	22.9	25.2	24.7	24.1	25.0	25.8	26.2	26.4	1.5	1.9	-0.1	0.6	0.3	0.2
Com per Employee	45.8	48.9	51.8	51.9	51.5	53.4	54.6	55.4	55.9	1.3	1.1	0.6	0.5	0.3	0.2
Prices (Nominal Dollars per million Btu)															
Electricity	18.93	19.09	18.76	19.05	19.10	19.38	20.17	21.05	22.44	0.2	-0.4	0.7	0.8	0.9	1.3
Electricity (cts/kwh)	6.46	6.51	6.40	6.50	6.52	6.61	6.88	7.18	7.66	0.2	-0.4	0.7	0.8	0.9	1.3
Natural Gas	4.49	5.07	7.42	9.78	7.15	6.91	7.70	8.88	10.17	2.5	7.9	-1.4	2.2	2.9	2.8
Petroleum															
Distillate Fuel	5.41	4.27	6.98	6.20	5.57	5.85	6.78	8.23	10.00	-4.6	10.3	-3.5	3.0	3.9	4.0
Residual Fuel Oil	3.16	2.81	4.02	3.54	3.75	3.47	4.04	4.99	6.12	-2.3	7.5	-2.9	3.0	4.3	4.2
Liquified Petroleum Ga	9.69	9.49	15.77	14.00	12.58	13.22	15.33	18.60	22.60	-0.4	10.7	-3.5	3.0	3.9	4.0
Average	13.84	14.19	15.19	16.06	15.40	15.53	16.49	17.66	19.26	0.5	1.4	0.4	1.2	1.4	1.8
Prices (2001 Dollars per million Btu)															
Electricity	23.72	21.23	19.11	19.05	18.76	17.90	16.78	15.50	14.22	-2.2	-2.1	-1.3	-1.3	-1.6	-1.7
Electricity (cts/kwh)	8.09	7.24	6.52	6.50	6.40	6.11	5.73	5.29	4.85	-2.2	-2.1	-1.3	-1.3	-1.6	-1.7
Natural Gas	5.62	5.64	7.56	9.78	7.02	6.38	6.41	6.54	6.45	0.1	6.0	-3.3	0.1	0.4	-0.3
Petroleum															
Distillate Fuel	6.78	4.75	7.11	6.20	5.47	5.40	5.64	6.06	6.34	-6.9	8.4	-5.3	0.9	1.4	0.9
Residual Fuel Oil	3.96	3.12	4.10	3.54	3.68	3.21	3.36	3.68	3.88	-4.6	5.6	-4.8	0.9	1.8	1.1
Liquified Petroleum Ga	12.14	10.55	16.07	14.00	12.35	12.21	12.76	13.70	14.32	-2.8	8.8	-5.3	0.9	1.4	0.9
Average	17.34	15.78	15.48	16.06	15.12	14.35	13.72	13.00	12.21	-1.9	-0.4	-1.5	-0.9	-1.1	-1.3
Energy Expenditures (Thousand Nominal Dollars)															
total	1977236	2401405	3093801	3250279	3089506	3381018	3958025	4587415	5378297	4.0	5.2	1.8	3.2	3.0	3.2
per employee ($)	634	694	786	833	793	830	901	978	1077	1.8	2.5	1.1	1.7	1.7	1.9
Energy Expenditures (Thousand 2001 Dollars)															
total	2477227	2670950	3151629	3250279	3033839	3123144	3293318	3378569	3408339	1.5	3.4	-0.2	1.1	0.5	0.2
per employee ($)	795	772	801	833	779	766	750	720	682	-0.6	0.7	-0.9	-0.4	-0.8	-1.1

North Carolina Energy Outlook

Industrial Sector

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Total Consumption Excl. NUG (Billion Btu)															
Electricity	106675	116223	119007	115282	113184	127349	142762	157151	170559	1.7	0.5	1.4	2.3	1.9	1.7
Natural Gas	87598	103319	106457	87338	95718	108527	118432	126004	129704	3.4	0.6	0.4	1.8	1.2	0.6
Petroleum	126520	162090	174215	164818	153573	163855	167705	169511	169433	5.1	1.5	-1.2	0.5	0.2	0.0
Liquified Petroleum (	13411	18531	16704	18805	18962	20154	21277	22591	23570	6.7	-2.1	3.8	1.1	1.2	0.9
Gasoline	4237	5094	5062	4828	4784	5169	5763	6372	6815	3.7	-0.1	0.4	2.2	2.0	1.4
Distillate Fuel	16998	26167	23417	22689	22612	23048	23636	24116	24634	9.0	-2.2	-0.3	0.5	0.4	0.4
Kerosene	790	652	394	387	370	383	389	390	392	-3.8	-9.6	-0.5	0.3	0.1	0.1
Residual Fuel Oil	30916	35037	35662	39010	26590	33674	33130	30122	25437	2.5	0.4	-1.1	-0.3	-1.9	-3.3
Lubes & Waxes	3546	3383	3491	3325	3267	3426	3636	3796	3983	-0.9	0.6	-0.4	1.2	0.9	1.0
Asphalt&Road Oil	27920	42642	42044	42420	43634	44646	46520	48770	51248	8.8	-0.3	1.2	0.8	0.9	1.0
Other	28700	30585	47442	33354	33354	33354	33354	33354	33354	1.3	9.2	-6.8	0.0	0.0	0.0
Coal	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Hydro	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Wood	50342	54885	58702	59489	77254	79595	83655	87922	92407	1.7	1.4	6.3	1.0	1.0	1.0
Total	371135	436517	458381	426927	439728	479326	512555	540589	562103	3.3	1.0	0.9	1.3	1.1	0.8
Consumption by Agriculture Sector (Billion Btu)															
Electricity	3710	4740	5900	6790	7050	8160	9523	11021	12294	5.0	4.5	6.7	3.1	3.0	2.2
Natural Gas	2460	2100	1990	2320	2348	2543	2721	2942	3102	-3.1	-1.1	5.0	1.4	1.6	1.1
Petroleum															
Liquified Petroleum (	9010	12253	11848	13997	14139	15240	16202	17425	18300	6.3	-0.7	5.2	1.2	1.5	1.0
Gasoline	2510	3188	3071	3493	3578	4001	4463	4985	5401	4.9	-0.7	5.4	2.2	2.2	1.6
Distillate Fuel	4460	5674	5630	6222	6357	7058	7800	8649	9314	4.9	-0.2	4.6	2.0	2.1	1.5
Kerosene	128	105	75	149	150	160	168	179	186	-3.9	-6.5	16.4	0.9	1.2	0.8
Total	22278	28060	28514	32971	33623	37164	40878	45200	48597	4.7	0.3	5.4	1.9	2.0	1.5
Consumption excl. AG and NUG (Billion Btu)															
Electricity	102965	111483	113107	108492	106134	119189	133239	146131	158265	1.6	0.3	1.1	2.3	1.9	1.6
Natural Gas	85138	101219	104467	85018	93369	105983	115711	123062	126602	3.5	0.6	0.3	1.8	1.2	0.6
Petroleum	110412	140870	153591	140957	129348	137395	139072	138274	136232	5.0	1.7	-2.2	0.2	-0.1	-0.3
Liquified Petroleum (	4401	6278	4856	4808	4823	4914	5075	5167	5270	7.4	-5.0	0.2	0.6	0.4	0.4
Gasoline	1727	1906	1991	1335	1205	1168	1300	1387	1414	2.0	0.9	-10.1	2.2	1.3	0.4
Distillate Fuel	12538	20493	17787	16467	16255	15990	15835	15468	15320	10.3	-2.8	-2.1	-0.2	-0.5	-0.2
Kerosene	662	547	319	237	220	223	220	211	206	-3.8	-10.2	-6.9	-0.2	-0.8	-0.5
Residual Fuel Oil	30916	35037	35662	39010	26590	33674	33130	30122	25437	2.5	0.4	-1.1	-0.3	-1.9	-3.3
Lubes & Waxes	3546	3383	3491	3325	3267	3426	3636	3796	3983	-0.9	0.6	-0.4	1.2	0.9	1.0
Asphalt & Road Oil	27920	42642	42044	42420	43634	44646	46520	48770	51248	8.8	-0.3	1.2	0.8	0.9	1.0
Other	28700	30585	47442	33354	33354	33354	33354	33354	33354	1.3	9.2	-6.8	0.0	0.0	0.0
Coal	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Hydro	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Wood	50342	54885	58702	59489	77254	79595	83655	87922	92407	1.7	1.4	6.3	1.0	1.0	1.0
Total	348857	408457	429867	393956	406105	442162	471676	495389	513507	3.2	1.0	0.6	1.3	1.0	0.7
Energy Efficiency Indicators															
Ind per Person	55.2	59.1	56.7	52.1	52.8	55.2	55.1	54.4	53.1	1.4	-0.9	-0.5	0.0	-0.2	-0.5
Ind per GSP96	2276	2200	1764	1605	1623	1580	1386	1194	1014	-0.7	-4.3	-2.2	-2.6	-2.9	-3.2
Prices (Nominal Dollars per million Btu)															
Electricity	13.99	14.21	13.48	14.07	13.82	14.04	14.62	15.27	16.29	0.3	-1.0	0.8	0.8	0.9	1.3
Electricity (cts/kwh)	4.77	4.85	4.60	4.80	4.72	4.79	4.99	5.21	5.56	0.3	-1.0	0.8	0.8	0.9	1.3
Natural Gas	3.36	3.45	5.18	6.31	4.70	4.86	5.47	6.43	7.44	0.5	8.5	-1.2	2.4	3.3	3.0
Petroleum															
Distillate Fuel	5.77	4.50	7.16	6.38	5.75	6.05	7.01	8.48	10.29	-4.9	9.7	-3.3	3.0	3.9	3.9
Residual Fuel Oil	3.16	2.81	4.13	3.63	3.86	3.58	4.15	5.13	6.28	-2.3	8.0	-2.8	3.0	4.3	4.1
Liquified Petroleum Ga	9.69	8.00	13.19	11.75	10.59	11.14	12.90	15.62	18.95	-3.8	10.5	-3.3	3.0	3.9	3.9
Coal	1.80	1.71	1.67	1.80	2.02	2.16	2.33	2.59	2.90	-1.0	-0.6	5.3	1.6	2.1	2.3
Average	8.23	7.81	8.93	9.42	8.87	8.99	9.81	10.96	12.40	-1.0	2.7	0.1	1.8	2.2	2.5
Prices (2001 Dollars per million Btu)															
Electricity	17.52	15.81	13.73	14.07	13.57	12.97	12.17	11.25	10.32	-2.0	-2.8	-1.1	-1.3	-1.6	-1.7
Electricity (cts/kwh)	5.98	5.39	4.69	4.80	4.63	4.43	4.15	3.84	3.52	-2.0	-2.8	-1.1	-1.3	-1.6	-1.7
Natural Gas	4.21	3.83	5.27	6.31	4.62	4.49	4.55	4.73	4.72	-1.9	6.6	-3.2	0.3	0.8	-0.1
Petroleum															
Distillate Fuel	7.23	5.00	7.29	6.38	5.65	5.59	5.83	6.25	6.52	-7.1	7.8	-5.2	0.9	1.4	0.9
Residual Fuel Oil	3.96	3.12	4.21	3.63	3.79	3.30	3.46	3.78	3.98	-4.6	6.1	-4.7	0.9	1.8	1.1
Liquified Petroleum Ga	12.14	8.90	13.43	11.75	10.40	10.29	10.73	11.51	12.01	-6.0	8.6	-5.2	0.9	1.4	0.9
Coal	2.25	1.91	1.70	1.80	1.98	1.99	1.94	1.91	1.84	-3.3	-2.3	3.3	-0.5	-0.3	-0.7
Average	10.31	8.69	9.10	9.42	8.71	8.30	8.16	8.07	7.86	-3.4	0.9	-1.8	-0.3	-0.2	-0.5
Energy Expenditures (Thousand Nominal Dollars)															
total (000$)	3053919	3410332	4092973	4021056	3898455	4306837	5028420	5923555	6971713	2.2	3.7	1.0	3.1	3.3	3.3
per employee ($)	980	986	1040	1030	1001	1057	1145	1263	1396	0.1	1.1	0.3	1.6	2.0	2.0
Energy Expenditures (Thousand 2001 Dollars)															
total (000$)	3826175	3793124	4169477	4021056	3828213	3978350	4183952	4362618	4418120	-0.2	1.9	-0.9	1.0	0.8	0.3
per employee ($)	1227	1097	1060	1030	983	976	953	930	885	-2.2	-0.7	-1.6	-0.5	-0.5	-1.0

North Carolina Energy Outlook

Transportation Sector

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Market Indicators															
Vehicle Miles Traveled	62752	76053	89154	91637	93926	100954	112851	125307	138513	3.9	3.2	2.5	2.3	2.1	2.0
Light-Duty Vehicle	--	69003	79902	82229	84353	90260	99858	109442	119138	--	3.0	2.5	2.0	1.8	1.7
Med & Hvy Trucks	--	7050	9252	9408	9573	10694	12993	15865	19375	--	5.6	2.9	4.0	4.1	4.1
Efficiency (Miles per Gallon)															
Light-Duty Vehicle	--	19.4	19.6	19.6	19.5	19.4	19.5	19.9	20.5	--	0.2	-0.2	0.1	0.4	0.6
Med & Hvy Trucks	--	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	--	0.0	0.0	0.0	0.0	0.0
Vehicle Miles Traveled															
Total VMT/person	9.3	10.3	11.0	11.2	11.3	11.6	12.1	12.6	13.1	2.0	1.4	1.1	0.9	0.8	0.7
Total VMT/GSP96	384.9	383.3	343.1	344.5	346.7	332.7	305.2	276.8	250.0	-0.1	-2.2	-0.6	-1.7	-1.9	-2.0
LDV Miles/person	--	9.3	9.9	10.0	10.1	10.4	10.7	11.0	11.3	--	1.1	1.0	0.7	0.5	0.4
M&H Miles/GSP96	--	35.5	35.6	35.4	35.3	35.2	35.1	35.0	35.0	--	0.0	-0.2	-0.1	-0.1	0.0
Consumption (Trillion	539715	607015	714499	732851	752434	816110	921229	1026609	1136694	2.4	3.3	2.7	2.5	2.2	2.1
On-Road	484924	552731	651097	668332	687139	745076	838748	930055	1022817	2.7	3.3	2.7	2.4	2.1	1.9
C. Natural Gas	2.1	9.3	4.0	5.0	5.0	5.0	5.0	5.0	5.0	35.1	-15.5	4.6	0.0	0.0	0.0
Gasoline	398897	445272	510033	524887	541181	582029	640657	688167	727425	2.2	2.8	2.7	1.9	1.4	1.1
Diesel	86025	107450	141060	143440	145953	163043	198086	241883	295387	4.5	5.6	2.9	4.0	4.1	4.1
Off-Road	54791	54284	63402	64519	65295	71033	82481	96554	113877	-0.2	3.2	2.3	3.0	3.2	3.4
Electricity	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Natural Gas / Pipel	6482	6301	7171	7171	7171	7171	7171	7171	7171	-0.6	2.6	0.0	0.0	0.0	0.0
Petroleum	48309	47983	56231	57348	58124	63862	75310	89383	106706	-0.1	3.2	2.6	3.4	3.5	3.6
Diesel	8628	13056	9958	9988	9870	10070	10222	10201	10283	8.6	-5.3	0.2	0.3	0.0	0.2
Aviation Gasoli	1074	704	960	1001	1045	1168	1369	1570	1774	-8.1	6.4	4.0	3.2	2.8	2.5
Jet Fuel	30817	28045	40076	41190	42109	47614	58776	72673	89666	-1.9	7.4	3.5	4.3	4.3	4.3
Residual Fuel	3270	1909	1019	975	933	889	877	909	970	-10.2	-11.8	-2.7	-0.3	0.7	1.3
Liquified Gases	580	509	431	425	418	428	464	518	588	-2.6	-3.3	-0.1	1.6	2.2	2.6
Lubes & Waxes	3941	3760	3787	3768	3749	3693	3602	3513	3426	-0.9	0.1	-0.5	-0.5	-0.5	-0.5
Energy Efficiency Indicators															
Trn Energy per Person	80.3	82.3	88.3	89.4	90.3	93.9	99.1	103.4	107.4	0.5	1.4	1.2	1.1	0.9	0.8
On-Road/Person	72.2	74.9	80.5	81.5	82.5	85.7	90.2	93.7	96.7	0.7	1.4	1.3	1.0	0.8	0.6
Off-Road/Person	15.8	15.0	16.0	16.1	16.2	17.1	19.0	21.4	24.3	-1.1	1.4	1.3	2.2	2.4	2.6
On-Road/GSP96	2974	2786	2506	2513	2536	2456	2268	2054	1846	-1.3	-2.1	-0.4	-1.6	-2.0	-2.1
Off-Road/GSP96	336	274	244	243	241	234	223	213	206	-4.0	-2.3	-0.8	-1.0	-0.9	-0.7
Prices (Nominal Cents per Gallon)															
Petroleum															
Diesel, Pump	121.38	109.20	147.83	138.61	129.29	134.07	148.64	170.39	197.07	-2.1	6.2	-1.9	2.1	2.8	3.0
Gasoline, Pump	117.15	110.34	143.70	136.80	132.25	135.40	153.35	179.32	211.70	-1.2	5.4	-1.2	2.5	3.2	3.4
Wholesale	78.55	62.56	95.95	88.73	80.87	83.21	96.49	117.09	142.22	-4.5	8.9	-2.8	3.0	3.9	4.0
Gas Tax, Federal	9.52	18.40	18.40	18.40	18.40	18.40	18.40	18.40	18.40	14.1	0.0	0.0	0.0	0.0	0.0
Gas Tax, S &L	21.50	21.60	21.20	24.10	24.10	25.77	29.33	33.43	38.96	0.1	-0.4	4.0	2.6	2.7	3.1
Dealer Margin	7.58	7.79	8.15	5.57	7.50	8.02	9.13	10.40	12.12	0.5	0.9	-0.3	2.6	2.7	3.1
Prices (2001 Cents per Gallon)															
Petroleum															
Diesel, Pump	152.07	121.45	150.60	138.61	126.96	123.84	123.67	125.49	124.89	-4.4	4.4	-3.8	0.0	0.3	-0.1
Gasoline, Pump	146.77	122.73	146.39	136.80	129.87	125.08	127.60	132.07	134.16	-3.5	3.6	-3.1	0.4	0.7	0.3
Wholesale	98.41	69.58	97.74	88.73	79.41	76.87	80.29	86.23	90.13	-6.7	7.0	-4.7	0.9	1.4	0.9
Gas Tax, Federal	11.92	20.47	18.74	18.40	18.07	17.00	15.31	13.55	11.66	11.4	-1.7	-1.9	-2.1	-2.4	-3.0
Gas Tax, S &L	26.94	24.02	21.60	24.10	23.67	23.80	24.41	24.62	24.69	-2.3	-2.1	2.0	0.5	0.2	0.1
Dealer Margin	9.50	8.66	8.30	5.57	7.36	7.41	7.60	7.66	7.68	-1.8	-0.8	-2.3	0.5	0.2	0.1
On-Road Energy Expenditures (Thousand Nominal Dollars)															
total	448920	477441	736358	717470	708303	787717	997802	1283848	1650986	1.2	9.1	1.4	4.8	5.2	5.2
per person ($)	67	65	91	87	85	91	107	129	156	-0.6	7.1	-0.1	3.4	3.8	3.8
On-Road Energy Expenditures (Thousand 2001 Dollars)															
total	562440	531031	750121	717470	695541	727637	830232	945537	1046265	-1.1	7.2	-0.6	2.7	2.6	2.0
per person ($)	84	72	93	87	83	84	89	95	99	-3.0	5.2	-2.0	1.3	1.3	0.8

North Carolina Energy Outlook

Electricity

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Sales (Million Kwh)															
Residential	33144	39506	45796	46602	48062	51686	57591	63402	69146	3.6	3.0	2.4	2.2	1.9	1.7
Commercial	25516	31104	39077	40390	39631	42766	47820	52523	57377	4.0	4.7	1.8	2.3	1.9	1.8
Industrial	31265	34063	34879	33787	33172	37324	41841	46058	49988	1.7	0.5	1.4	2.3	1.9	1.7
Transportation	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Interdepartmental	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Total	89924	104673	119752	120779	120864	131777	147252	161983	176511	3.1	2.7	1.9	2.2	1.9	1.7
Energy Efficiency Indicators															
Elc per Person	13.38	14.18	14.80	14.73	14.51	15.16	15.83	16.31	16.68	1.2	0.9	0.5	0.9	0.6	0.5
Elc per GSP96	551.55	527.58	460.85	454.06	446.13	434.33	398.17	357.78	318.57	-0.9	-2.7	-1.2	-1.7	-2.1	-2.3
Prices (nominal cents per kwh)															
Residential	7.8	8.1	8.0	8.2	8.2	8.3	8.6	9.0	9.6	0.7	-0.3	0.7	0.8	0.8	1.3
Commercial	6.5	6.5	6.4	6.5	6.5	6.6	6.9	7.2	7.7	0.2	-0.4	0.7	0.8	0.9	1.3
Industrial	4.8	4.8	4.6	4.8	4.7	4.8	5.0	5.2	5.6	0.3	-1.0	0.8	0.8	0.9	1.3
Average	6.4	6.6	6.5	6.7	6.7	6.8	7.0	7.3	7.8	0.6	-0.3	0.8	0.8	0.9	1.3
Prices (2001 cents per kwh)															
Residential	9.8	9.0	8.1	8.2	8.0	7.7	7.2	6.6	6.1	-1.7	-2.0	-1.2	-1.3	-1.6	-1.7
Commercial	8.1	7.2	6.5	6.5	6.4	6.1	5.7	5.3	4.9	-2.2	-2.1	-1.3	-1.3	-1.6	-1.7
Industrial	6.0	5.4	4.7	4.8	4.6	4.4	4.2	3.8	3.5	-2.0	-2.8	-1.1	-1.3	-1.6	-1.7
Average	8.0	7.3	6.6	6.7	6.6	6.2	5.8	5.4	5.0	-1.8	-2.0	-1.1	-1.3	-1.6	-1.7
Energy Expenditures - Electricity (Thousand Nominal Dollars)															
total	5739610	6884955	7769008	8068515	8076279	8902560	10347267	11874809	13801936	3.7	2.4	2.8	3.1	2.8	3.1
per person ($)	854	933	960	984	970	1024	1113	1196	1305	1.8	0.6	1.3	1.7	1.5	1.8
Energy Expenditures - Electricity (Thousand 2001 Dollars)															
total	7191006	7657756	7914223	8068515	7930760	8223551	8609558	8745636	8746576	1.3	0.7	0.8	0.9	0.3	0.0
per person ($)	1070	1038	978	984	952	946	926	881	827	-0.6	-1.2	-0.7	-0.4	-1.0	-1.3

North Carolina Energy Outlook

Power Supply Industry

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Fuel Prices (Nominal Dollars per million Btu)															
Natural Gas	3.10	2.33	4.34	4.67	4.66	4.83	5.44	6.52	7.62	-5.6	13.3	2.1	2.4	3.7	3.2
Distillate Fuel	5.12	3.82	7.04	6.02	5.11	5.21	6.06	7.40	9.04	-5.7	13.1	-5.9	3.1	4.1	4.1
Residual Fuel Oil	3.16	2.81	4.13	3.63	3.86	3.58	4.15	5.13	6.28	-2.3	8.0	-2.8	3.0	4.3	4.1
Coal	1.78	1.63	1.43	1.59	1.75	1.85	1.99	2.19	2.44	-1.8	-2.6	5.3	1.4	2.0	2.2
Fuel Prices (2001 Dollars per million Btu)															
Natural Gas	3.88	2.59	4.42	4.67	4.57	4.46	4.53	4.80	4.83	-7.8	11.3	0.2	0.3	1.2	0.1
Distillate Fuel	6.42	4.24	7.18	6.02	5.02	4.81	5.04	5.45	5.73	-7.9	11.1	-7.7	1.0	1.6	1.0
Residual Fuel Oil	3.96	3.12	4.21	3.63	3.79	3.30	3.46	3.78	3.98	-4.6	6.1	-4.7	0.9	1.8	1.1
Coal	2.23	1.81	1.46	1.59	1.71	1.71	1.65	1.62	1.55	-4.1	-4.3	3.3	-0.7	-0.4	-0.8
Fuel Prices (2001 Cents per Kwh)															
Natural Gas	6.0	3.3	5.2	5.3	5.1	4.5	3.9	3.6	3.1	-11.3	9.2	-2.6	-2.7	-1.9	-2.9
Distillate Fuel	7.5	5.3	9.5	8.0	6.6	6.3	6.5	7.0	7.3	-6.6	12.2	-7.9	0.8	1.4	0.8
Residual Fuel Oil	4.6	3.9	5.6	4.8	5.0	4.3	4.5	4.9	5.1	-3.2	7.2	-4.9	0.7	1.6	0.9
Coal	2.2	1.7	1.4	1.6	1.7	1.7	1.6	1.6	1.5	-4.3	-4.0	3.5	-0.7	-0.4	-0.8
Generation/Sales	0.95	1.02	1.02	0.98	1.00	1.02	1.02	1.02	1.02	1.5	0.1	0.0	0.0	0.0	0.0
Capacity, inc. NUG (megawatts)															
Natural Gas & Oil	1602	2633	5489	6269	6419	7499	9309	9309	9309	10.4	15.8	6.4	4.4	0.0	0.0
Coal	13174	13512	13452	13452	13452	14607	16250	19538	22780	0.5	-0.1	1.7	2.2	3.8	3.1
Nuclear	5125	5125	5182	5182	5182	5182	5182	5182	5182	0.0	0.2	0.0	0.0	0.0	0.0
Hydro	1957	1984	1918	1918	1918	1918	1918	1918	1918	0.3	-0.7	0.0	0.0	0.0	0.0
Other	203	221	204	204	204	204	204	204	204	1.7	-1.6	0.0	0.0	0.0	0.0
Total	22061	23475	26245	27025	27175	29409	32863	36150	39393	1.3	2.3	2.3	2.2	1.9	1.7
Reserve Margin	1.36	1.16	1.13	1.21	1.18	1.15	1.15	1.15	1.15	-3.2	-0.6	0.4	0.0	0.0	0.0
Capacity Utilization (Percent)															
Natural Gas & Oil	0.04	0.06	0.05	0.04	0.04	0.07	0.07	0.10	0.14	6.0	-3.7	9.8	-0.8	7.8	6.3
Coal	0.47	0.52	0.65	0.62	0.63	0.66	0.69	0.65	0.61	2.2	4.3	0.4	1.0	-1.4	-1.1
Nuclear	0.58	0.80	0.86	0.83	0.83	0.84	0.85	0.87	0.88	6.8	1.5	-0.5	0.3	0.3	0.3
Hydro	0.41	0.32	0.21	0.19	0.32	0.32	0.32	0.32	0.32	-4.5	-8.5	9.0	0.0	0.0	0.0
Other	0.92	0.92	0.71	0.80	0.80	0.82	0.84	0.87	0.89	0.0	-5.2	2.9	0.6	0.6	0.6
Average	0.44	0.52	0.53	0.50	0.51	0.52	0.52	0.52	0.52	3.3	0.6	-0.4	0.0	0.0	0.0
Generation (million Kwh)															
Natural Gas & Oil	585	1286	2223	2177	2236	4839	5783	8426	11433	17.1	11.6	16.8	3.6	7.8	6.3
Natural Gas	251	796	985	999	1028	3495	4281	6775	9633	26.0	4.4	28.8	4.1	9.6	7.3
Oil	334	490	1238	1178	1208	1344	1502	1652	1800	8.0	20.4	1.7	2.2	1.9	1.7
Coal	54328	62122	76265	73114	73930	84508	98737	110506	121707	2.7	4.2	2.1	3.2	2.3	1.9
Nuclear	25904	35910	39127	37775	37888	38229	38796	39364	39931	6.8	1.7	-0.5	0.3	0.3	0.3
Hydro	6994	5634	3499	3114	5376	5376	5376	5376	5376	-4.2	-9.1	9.0	0.0	0.0	0.0
Other	1643	1787	1266	1425	1434	1461	1505	1550	1595	1.7	-6.7	2.9	0.6	0.6	0.6
Total	84985	106454	122419	117836	120864	134412	150197	165223	180041	4.6	2.8	1.9	2.2	1.9	1.7
Heat Rates (Thousand Btu/kwh)															
Natural Gas	15.50	12.79	11.65	11.44	11.10	10.13	8.70	7.47	6.41	-3.8	-1.9	-2.7	-3.0	-3.0	-3.0
Petroleum	11.69	12.57	13.24	13.22	13.19	13.11	12.98	12.85	12.72	1.5	1.0	-0.2	-0.2	-0.2	-0.2
Coal	9.69	9.59	9.70	9.82	9.82	9.82	9.82	9.82	9.82	-0.2	0.2	0.2	0.0	0.0	0.0
Nuclear	10.68	10.66	10.62	10.62	10.62	10.62	10.62	10.62	10.62	0.0	-0.1	0.0	0.0	0.0	0.0
Hydro	10.39	10.30	10.35	10.35	10.35	10.35	10.35	10.35	10.35	-0.2	0.1	0.0	0.0	0.0	0.0
Other	10.35	10.35	10.35	10.35	10.35	10.35	10.35	10.35	10.35	0.0	0.0	0.0	0.0	0.0	0.0
Fuel Consumption (Billion Btu)															
Natural Gas	3885	10184	11471	11431	11407	35406	37241	50608	61793	21.3	2.4	25.3	1.0	6.3	4.1
Petroleum	3905	6160	16394	15568	15937	17617	19490	21226	22899	9.5	21.6	1.4	2.0	1.7	1.5
Distillate Fuel	2174	2942	4673	4438	4543	5022	5555	6050	6527	6.2	9.7	1.4	2.0	1.7	1.5
Residual Fuel	1731	3218	11721	11131	11394	12595	13934	15176	16372	13.2	29.5	1.4	2.0	1.7	1.5
Coal	526246	595503	739383	717614	725620	829439	969099	1084616	1194547	2.5	4.4	2.3	3.2	2.3	1.9
Nuclear	276669	382731	415646	401284	402489	406106	412134	418162	424189	6.7	1.7	-0.5	0.3	0.3	0.3
Hydro	72696	58050	36204	32222	55620	55620	55620	55620	55620	-4.4	-9.0	9.0	0.0	0.0	0.0
Other	16993	18488	13098	14743	14835	15113	15575	16037	16499	--	--	--	--	--	--
Total	900395	1071117	1232195	1192863	1225908	1359300	1509159	1646268	1775548	3.5	2.8	2.0	2.1	1.8	1.5

North Carolina Energy Outlook

Natural Gas

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Consumption (Billion Btu)															
Residential	36122	51009	65558	58739	64014	69326	77960	86447	94841	7.1	5.1	1.1	2.4	2.1	1.9
Commercial	32277	38595	44226	39557	40580	45619	49967	53355	55925	3.6	2.8	0.6	1.8	1.3	0.9
Industrial (x-NUG x-A	85138	101219	104467	85018	93369	105983	115711	123062	126602	3.5	0.6	0.3	1.8	1.2	0.6
Agriculture	2460	2100	1990	2320	2348	2543	2721	2942	3102	-3.1	-1.1	5.0	1.4	1.6	1.1
Transportation	6484	6311	7175	7176	7176	7176	7176	7176	7176	-0.5	2.6	0.0	0.0	0.0	0.0
Power (inc. NUG)	3885	10184	11471	11431	11407	35406	37241	50608	61793	21.3	2.4	25.3	1.0	6.3	4.1
Total	167709	216351	236587	207914	218894	266053	290777	323589	349439	5.2	1.8	2.4	1.8	2.2	1.5
Energy Efficiency Indicators															
NG per Person	25.0	29.3	29.2	25.4	26.3	30.6	31.3	32.6	33.0	3.3	0.0	0.9	0.4	0.8	0.3
NG per GSP96	1029	1090	910	782	808	877	786	715	631	1.2	-3.5	-0.7	-2.2	-1.9	-2.5
Average Lower-48 Wellhead Price of Natural Gas (Dollars per Million Btu)															
Nominal	1.67	1.51	3.51	4.01	2.85	3.14	3.59	4.36	5.14	-1.9	18.4	-2.2	2.8	4.0	3.3
2001$	2.09	1.68	3.57	4.01	2.80	2.90	2.99	3.21	3.26	-4.3	16.3	-4.1	0.6	1.5	0.3
Prices (Nominal Dollars per Million Btu)															
Residential	5.98	6.71	9.29	12.00	9.36	9.09	10.10	11.55	13.18	2.3	6.7	-0.4	2.1	2.7	2.7
Commercial	4.49	5.07	7.42	9.78	7.15	6.91	7.70	8.88	10.17	2.5	7.9	-1.4	2.2	2.9	2.8
Industrial	3.36	3.45	5.18	6.31	4.70	4.86	5.47	6.43	7.44	0.5	8.5	-1.2	2.4	3.3	3.0
Electric Utilities	3.10	2.33	4.34	4.67	4.66	4.83	5.44	6.52	7.62	-5.6	13.3	2.1	2.4	3.7	3.2
Prices (2001 Dollars per Million Btu)															
Residential	7.49	7.46	9.46	12.00	9.19	8.40	8.40	8.51	8.35	-0.1	4.9	-2.4	0.0	0.3	-0.4
Commercial	5.62	5.64	7.56	9.78	7.02	6.38	6.41	6.54	6.45	0.1	6.0	-3.3	0.1	0.4	-0.3
Industrial	4.21	3.83	5.27	6.31	4.62	4.49	4.55	4.73	4.72	-1.9	6.6	-3.2	0.3	0.8	-0.1
Electric Utilities	3.88	2.59	4.42	4.67	4.57	4.46	4.53	4.80	4.83	-7.8	11.3	0.2	0.3	1.2	0.1
Implied Transportation and Distribution (2001 Dollars per Million Btu)															
Residential	5.40	5.78	5.89	7.99	6.39	5.50	5.41	5.29	5.10	1.4	0.4	-1.4	-0.3	-0.4	-0.8
Commercial	3.53	3.96	3.98	5.76	4.22	3.49	3.42	3.32	3.19	2.3	0.1	-2.6	-0.4	-0.6	-0.8
Industrial	2.13	2.15	1.70	2.30	1.81	1.59	1.56	1.52	1.46	0.3	-4.6	-1.3	-0.4	-0.5	-0.8
Electric Utilities	1.80	0.91	0.85	0.66	1.77	1.56	1.54	1.59	1.57	-12.7	-1.3	12.9	-0.3	0.6	-0.2
Energy Expenditures (Thousand Nominal Dollars)															
Residential	215969	342196	608938	704750	599167	630160	787025	998390	1250335	9.6	12.2	0.7	4.5	4.9	4.6
Commercial	144812	195777	328031	386706	290144	315262	384899	473615	568974	6.2	10.9	-0.8	4.1	4.2	3.7
Industrial	286276	348830	540656	536583	438836	515131	632997	790898	942351	4.0	9.2	-1.0	4.2	4.6	3.6
Transportation	29090	32011	53218	70151	51308	49592	55277	63699	73008	1.9	10.7	-1.4	2.2	2.9	2.8
Power	12035	23709	49819	53346	53105	170965	202697	329775	471025	14.5	16.0	28.0	3.5	10.2	7.4
Total	688181	942522	1580663	1751536	1432561	1681110	2062895	2656377	3305694	6.5	10.9	1.2	4.2	5.2	4.5
Energy Expenditures (Thousand 2001 Dollars)															
Residential	270581	380605	620321	704750	588371	582096	654853	735301	792364	7.1	10.3	-1.3	2.4	2.3	1.5
Commercial	181431	217752	334163	386706	284917	291216	320259	348811	360571	3.7	8.9	-2.7	1.9	1.7	0.7
Industrial	358668	387984	550762	536583	430929	475842	526692	582485	597188	1.6	7.3	-2.9	2.1	2.0	0.5
Transportation	36446	35604	54213	70151	50384	45809	45994	46914	46267	-0.5	8.8	-3.3	0.1	0.4	-0.3
Power	15078	26370	50750	53346	52148	157925	168657	242875	298498	11.8	14.0	25.5	1.3	7.6	4.2
Total	862204	1048315	1610208	1751536	1406749	1552889	1716455	1956386	2094887	4.0	9.0	-0.7	2.0	2.7	1.4

North Carolina Energy Outlook

Coal

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Consumption (Billion Btu)															
Residential	1378	1970	969	969	989	1047	1141	1231	1318	7.4	-13.2	1.6	1.7	1.5	1.4
Commercial	2560	3659	1800	1800	1809	1917	2084	2233	2381	7.4	-13.2	1.3	1.7	1.4	1.3
Industrial (x-NUG x-AG)	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Power (inc. NUG)	526246	595503	739383	717614	725620	829439	969099	1084616	1194547	2.5	4.4	2.3	3.2	2.3	1.9
Total	530184	601133	742151	720383	728418	832403	972324	1088080	1198246	2.5	4.3	2.3	3.2	2.3	1.9
Energy Efficiency Indicators															
Coal per Person	78.9	81.5	91.7	87.9	87.4	95.8	104.6	109.6	113.3	0.6	2.4	0.9	1.8	0.9	0.7
Coal per GSP96	3252	3030	2856	2708	2689	2744	2629	2403	2163	-1.4	-1.2	-0.8	-0.8	-1.8	-2.1
Average Mine-mouth Price of Coal (Dollars per Million Btu)															
Nominal	1.070	0.966	0.950	1.090	1.090	1.140	1.220	1.360	1.530	-2.0	-0.3	3.7	1.4	2.2	2.4
2001$	1.341	1.074	0.968	1.090	1.070	1.053	1.015	1.002	0.970	-4.3	-2.1	1.7	-0.7	-0.3	-0.6
Prices (Nominal Dollars per Million Btu)															
Industrial	1.80	1.71	1.67	1.80	2.02	2.16	2.33	2.59	2.90	-1.0	-0.6	5.3	1.6	2.1	2.3
Electric Power	1.78	1.63	1.43	1.59	1.75	1.85	1.99	2.19	2.44	-1.8	-2.6	5.3	1.4	2.0	2.2
Prices (2001 Dollars per Million Btu)															
Industrial	2.25	1.91	1.70	1.80	1.98	1.99	1.94	1.91	1.84	-3.3	-2.3	3.3	-0.5	-0.3	-0.7
Electric Power	2.23	1.81	1.46	1.59	1.71	1.71	1.65	1.62	1.55	-4.1	-4.3	3.3	-0.7	-0.4	-0.8
Implied Transportation and Distribution (2001 Dollars per Million Btu)															
Industrial	0.91	0.83	0.73	0.71	0.91	0.94	0.93	0.91	0.87	-1.9	-2.6	5.2	-0.2	-0.4	-0.8
Electric Power	0.89	0.74	0.49	0.50	0.64	0.66	0.64	0.61	0.58	-3.7	-7.9	6.1	-0.7	-0.7	-1.2
Energy Expenditures (Thousand Nominal Dollars)															
Residential	2479	3376	1614	1746	1995	2257	2663	3193	3828	6.4	-13.7	6.9	3.4	3.7	3.7
Commercial	4604	6269	2997	3243	3649	4132	4867	5791	6914	6.4	-13.7	6.6	3.3	3.5	3.6
Industrial	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Power	936719	969479	1057317	1141006	1266207	1536618	1923661	2379973	2920548	0.7	1.7	7.8	4.6	4.3	4.2
Total	943802	979124	1061927	1145995	1271850	1543007	1931192	2388956	2931290	0.7	1.6	7.8	4.6	4.3	4.2
Energy Expenditures (Thousand 2001 Dollars)															
Residential	3106	3755	1644	1746	1959	2085	2216	2351	2426	3.9	-15.2	4.9	1.2	1.2	0.6
Commercial	5768	6973	3053	3243	3583	3817	4050	4265	4381	3.9	-15.2	4.6	1.2	1.0	0.5
Industrial	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Power	1173590	1078299	1077080	1141006	1243392	1419418	1600604	1752818	1850813	-1.7	0.0	5.7	2.4	1.8	1.1
Total	1182465	1089026	1081776	1145995	1248934	1425320	1606869	1759434	1857620	-1.6	-0.1	5.7	2.4	1.8	1.1

North Carolina Energy Outlook

Oil

										Growth Rates					
	1990	1995	2000	2001	2002	2005	2010	2015	2020	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
Consumption (Billion Btu)															
Motor Gasoline	407239	450683	515807	531297	546962	588221	647489	695651	735400	2.0	2.7	2.7	1.9	1.4	1.1
Commercial	4105	317	712	1583	997	1023	1069	1113	1160	-40.1	17.5	7.5	0.9	0.8	0.8
Industrial	4237	5094	5062	4828	4784	5169	5763	6372	6815	3.7	-0.1	0.4	2.2	2.0	1.4
Transportation	398897	445272	510033	524887	541181	582029	640657	688167	727425	2.2	2.8	2.7	1.9	1.4	1.1
Distillate Fuel	145828	185527	212004	211445	214572	233850	270798	316019	370965	4.9	2.7	2.0	3.0	3.1	3.3
Residential	20715	22687	17983	17161	17983	18315	19021	19828	20683	1.8	-4.5	0.4	0.8	0.8	0.8
Commercial	11288	13224	14912	13729	13612	14353	14278	13941	13451	3.2	2.4	-0.8	-0.1	-0.5	-0.7
Industrial	16998	26167	23417	22689	22612	23048	23636	24116	24634	9.0	-2.2	-0.3	0.5	0.4	0.4
Transportation	94653	120506	151019	153428	155823	173112	208308	252083	305670	4.9	4.6	2.8	3.8	3.9	3.9
Power	2174	2942	4673	4438	4543	5022	5555	6050	6527	6.2	9.7	1.4	2.0	1.7	1.5
Residual Fuel	39069	43209	51261	53785	39960	48180	48946	47202	43775	2.0	3.5	-1.2	0.3	-0.7	-1.5
Commercial	1421	1182	898	759	895	874	857	847	848	-3.6	-5.4	-0.5	-0.4	-0.2	0.0
Industrial	30916	35037	35662	39010	26590	33674	33130	30122	25437	2.5	0.4	-1.1	-0.3	-1.9	-3.3
Transportation	3270	1909	1019	975	933	889	877	909	970	-10.2	-11.8	-2.7	-0.3	0.7	1.3
Power	1731	3218	11721	11131	11394	12595	13934	15176	16372	13.2	29.5	1.4	2.0	1.7	1.5
Liquified Gases	32232	43974	48235	48544	50957	54727	60046	65473	70547	6.4	1.9	2.6	1.9	1.7	1.5
Residential	15505	21194	26349	25046	26998	29267	32954	36579	40164	6.5	4.5	2.1	2.4	2.1	1.9
Commercial	2736	3740	4752	4268	4579	4878	5351	5784	6225	6.5	4.9	0.5	1.9	1.6	1.5
Industrial	13411	18531	16704	18805	18962	20154	21277	22591	23570	6.7	-2.1	3.8	1.1	1.2	0.9
Transportation	580	509	431	425	418	428	464	518	588	-2.6	-3.3	-0.1	1.6	2.2	2.6
Jet Fuel	30817	28045	40076	41190	42109	47614	58776	72673	89666	-1.9	7.4	3.5	4.3	4.3	4.3
Transportation	30817	28045	40076	41190	42109	47614	58776	72673	89666	-1.9	7.4	3.5	4.3	4.3	4.3
Kerosene	9216	13380	12939	13035	13209	13861	14750	15548	16271	7.7	-0.7	1.4	1.3	1.1	0.9
Residential	7983	11894	11220	11428	11629	12201	13093	13918	14683	8.3	-1.2	1.7	1.4	1.2	1.1
Commercial	443	834	1326	1221	1210	1276	1269	1239	1196	13.5	9.7	-0.8	-0.1	-0.5	-0.7
Industrial	790	652	394	387	370	383	389	390	392	-3.8	-9.6	-0.5	0.3	0.1	0.1
Asphalt & Road Oil	27920	42642	42044	42420	43634	44646	46520	48770	51248	8.8	-0.3	1.2	0.8	0.9	1.0
Industrial	27920	42642	42044	42420	43634	44646	46520	48770	51248	8.8	-0.3	1.2	0.8	0.9	1.0
Lubes & Waxes	7487	7143	7278	7093	7016	7119	7238	7308	7408	-0.9	0.4	-0.4	0.3	0.2	0.3
Industrial	3546	3383	3491	3325	3267	3426	3636	3796	3983	-0.9	0.6	-0.4	1.2	0.9	1.0
Transportation	3941	3760	3787	3768	3749	3693	3602	3513	3426	-0.9	0.1	-0.5	-0.5	-0.5	-0.5
Aviation Gasoline	1074	704	960	1001	1045	1168	1369	1570	1774	-8.1	6.4	4.0	3.2	2.8	2.5
Transportation	1074	704	960	1001	1045	1168	1369	1570	1774	-8.1	6.4	4.0	3.2	2.8	2.5
Other	28700	30585	47442	33354	33354	33354	33354	33354	33354	1.3	9.2	-6.8	0.0	0.0	0.0
Industrial	28700	30585	47442	33354	33354	33354	33354	33354	33354	1.3	9.2	-6.8	0.0	0.0	0.0
Total	729583	845890	978045	983167	992819	1072741	1189287	1303567	1420409	3.0	2.9	1.9	2.1	1.9	1.7
Energy Efficiency Indicators															
Oil per Person	108.6	114.6	120.9	119.9	119.2	123.4	127.9	131.3	134.3	1.1	1.1	0.4	0.7	0.5	0.4
Oil per GSP96	4475	4264	3764	3696	3665	3536	3216	2879	2564	-1.0	-2.5	-1.2	-1.9	-2.2	-2.3
Refiners' Price of Petroleum Products (Nominal Dollars per Barrel)															
Crude Oil	22.34	17.23	28.21	22.96	23.87	22.67	26.38	32.65	40.09	-5.1	10.4	-4.3	3.1	4.4	4.2
Gasoline (Cts/Gal)	78.55	62.56	95.95	88.73	80.87	83.21	96.49	117.09	142.22	-4.5	8.9	-2.8	3.0	3.9	4.0
Distillate/Diesel	29.06	22.26	37.50	32.72	28.91	30.28	35.31	43.28	52.96	-5.2	11.0	-4.2	3.1	4.2	4.1
Residual Fuel	18.81	16.42	25.17	22.00	23.39	21.53	25.06	31.09	38.21	-2.7	8.9	-3.1	3.1	4.4	4.2
Jet Feul	32.21	22.68	37.64	32.45	29.12	30.60	35.31	43.28	52.96	-6.8	10.7	-4.1	2.9	4.2	4.1
Refiners' Price of Petroleum Products (2001 Dollars per Barrel)															
Crude Oil	27.99	19.16	28.74	22.96	23.44	20.94	21.95	24.04	25.41	-7.3	8.4	-6.1	0.9	1.8	1.1
Gasoline (Cts/Gal)	98.41	69.58	97.74	88.73	79.41	76.87	80.29	86.23	90.13	-6.7	7.0	-4.7	0.9	1.4	0.9
Distillate/Diesel	36.41	24.75	38.20	32.72	28.39	27.97	29.38	31.88	33.56	-7.4	9.1	-6.0	1.0	1.6	1.0
Residual Fuel	23.57	18.27	25.64	22.00	22.97	19.89	20.85	22.90	24.21	-5.0	7.0	-4.9	0.9	1.9	1.1
Jet Feul	40.35	25.23	38.34	32.45	28.59	28.27	29.38	31.88	33.56	-9.0	8.7	-5.9	0.8	1.6	1.0
Prices (Nominal Dollars per Million Btu)															
Motor Gasoline															
Pump	9.44	8.90	11.58	11.03	10.66	10.92	12.36	14.46	17.07	-1.2	5.4	-1.2	2.5	3.2	3.4
Distillate Fuel															
Residential	7.95	6.28	10.32	9.52	8.86	9.38	10.75	12.77	15.27	-4.6	10.4	-1.9	2.8	3.5	3.6
Commercial	5.41	4.27	6.98	6.20	5.57	5.85	6.78	8.23	10.00	-4.6	10.3	-3.5	3.0	3.9	4.0
Industrial	5.77	4.50	7.16	6.38	5.75	6.05	7.01	8.48	10.29	-4.9	9.7	-3.3	3.0	3.9	3.9
Power	5.12	3.82	7.04	6.02	5.11	5.21	6.06	7.40	9.04	-5.7	13.1	-5.9	3.1	4.1	4.1
Residual Fuel															
Commercial	3.16	2.81	4.02	3.54	3.75	3.47	4.04	4.99	6.12	-2.3	7.5	-2.9	3.0	4.3	4.2
Industrial	3.16	2.81	4.13	3.63	3.86	3.58	4.15	5.13	6.28	-2.3	8.0	-2.8	3.0	4.3	4.1
Power	3.16	2.81	4.13	3.63	3.86	3.58	4.15	5.13	6.28	-2.3	8.0	-2.8	3.0	4.3	4.1
Liquified Gases															
Residential	11.22	11.39	16.17	14.92	13.88	14.70	16.85	20.01	23.93	0.3	7.3	-1.9	2.8	3.5	3.6
Commercial	9.69	9.49	15.77	14.00	12.58	13.22	15.33	18.60	22.60	-0.4	10.7	-3.5	3.0	3.9	4.0
Industrial	9.69	8.00	13.19	11.75	10.59	11.14	12.90	15.62	18.95	-3.8	10.5	-3.3	3.0	3.9	3.9
Prices (2001 Dollars per Million Btu)															
Motor Gasoline															
Pump	11.83	9.89	11.80	11.03	10.47	10.08	10.29	10.65	10.82	-3.5	3.6	-3.1	0.4	0.7	0.3
Distillate Fuel															
Residential	9.96	6.98	10.51	9.52	8.70	8.67	8.94	9.41	9.68	-6.8	8.5	-3.8	0.6	1.0	0.6
Commercial	6.78	4.75	7.11	6.20	5.47	5.40	5.64	6.06	6.34	-6.9	8.4	-5.3	0.9	1.4	0.9
Industrial	7.23	5.00	7.29	6.38	5.65	5.59	5.83	6.25	6.52	-7.1	7.8	-5.2	0.9	1.4	0.9